COOK INLET AREA SHELLFISH MANAGEMENT REPORT TO THE ALASKA BOARD OF FISHERIES

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INTRODUCTION

The Cook Inlet Management Area, Statistical Area H, has as its eastern boundary the longitude of Cape Fairfield (148^0 50' W. long.) and its southern boundary the latitude of Cape Douglas (58^0 52' N. lat.). The management area is divided into six shellfish districts: Southern, Kamishak, Barren Islands, Outer, Eastern and Central (Figure 1).

A discrete management area (G) has been established specifically for the trawl and pot shrimp fisheries in the Outer and Eastern Districts (Figure 2). Area G has as its boundaries the longitude of Cape Fairfield on the east and a line drawn from the westernmost tip of Point Adam to the westernmost tip of Cape Elizabeth and south along 151^0 53' W. longitude on the west.

This report covers the most recent shellfish fisheries in Cook Inlet: 1989 Dungeness (Cancer magister), razor clam (Siliqua patula), hardshell clams, blue mussels (Mytilus edulis), green urchin (Strongylocentrotus droebachiensis), 1989-90 Tanner crab (Chionoecetes bairdi) and Area G pot shrimp. The 1989 seasons for scallops (Pecten caurinus) and octopus (Octopus dofleini) were open but no one fished. This was also the case for the 1989-90 Area G trawl shrimp fishery. The 1989 seasons for red king crab (Paralithodes camtschatica), and the 1989-90 Area H trawl and pot shrimp fisheries were closed due to low stock conditions. A summary of the king crab, scallop and shrimp stocks as well as historic fisheries are given in this report.

Shellfish landings from the Cook Inlet Management Area (H) included 510,034 pounds of Tanner crab, 178,064 pounds of Dungeness crab, 15,181 pounds of urchins, 222,747 pounds of razor clams, 19,840 pounds of hardshell clams and 167,243 pounds of mussels. Shrimp landings for Area G included 20,500 pounds of pot caught shrimp.

The approximate ex-vessel value by species was $1.18 million for Tanner crabs, $230,000 for Dungeness, $210,000 for razor clams and $278,000 for hardshell clams and mussels. No price information is currently available for urchins. Ex-vessel value for Area G pot shrimp was $60,000. Total estimated ex-vessel value of all shellfish species for the Cook Inlet Management Area was approximately $1.96 million.

TANNER CRAB FISHERY

Introduction

Historically Tanner crab fishing has occurred in six of the districts of the Cook Inlet Management Area (H): Southern, Kamishak, Barren Islands, Central, Outer and Eastern (Figure 1). Historical catch, since inception of the minimum legal size in 1976, has ranged from 1.5 million pounds in 1988 to 5.7 million pounds in 1978-79 (Figure 3, Appendix Table 1). The number of participating vessels has ranged from 51 in 1981-82 to 137 in the 1988 season. The entire management area was closed for the 1989 season due to depressed stock conditions.

The Southern District is fished by both small and large vessels. The fishery occurs in the relatively protected waters of Kachemak Bay. A significant number of the vessels have dry holds. The Homer and Seldovia boat harbors, home ports of most of the fleet, are no more than a three hour run from the geographic extremes of the district. Fishing depths ranged from 5 to 95 fathoms, but generally are between 30 and 55. Historical annual harvest when the fishery was open has ranged from 0.5 to 2.9 million pounds. Recent vessel effort has been high with 127 vessels fishing during the 1988 season (Appendix Table 1).

The Kamishak Bay and Barren Islands Districts are often considered one management unit as survey, fishery and tag recovery information show that these two districts contain a single stock of Tanner crabs. The fishery in the Kamishak and Barren Islands Districts occurs in open waters subject to severe weather and icing conditions, as well as extreme tides and seasonal ice flows from upper Cook Inlet and Kamishak Bay itself. All participating vessel have circulating sea water systems. The smallest vessels are generally 50 feet in keel length. The smaller vessels are often extremely limited in fishing time by the weather conditions. Many fishermen generally fish around the clock; the boats jog while the gear soaks. Safe anchorage from storms is located behind Augustine Island or in Iniskin Bay. Fishing occurs in a 15 to 90 fathom depth range. Historical catch since full development of the fishery and implementation of the legal minimum size has ranged from 0.4 to 3.3 million pounds. Vessel effort has ranged from 17 to 28 boats (Appendix Table 1).

The Outer and Eastern Districts are located in the Gulf of Alaska bordering the Prince William Sound Management Area (E) on the east at Cape Fairfield. Recently this fishery has occurred in or near the mouths of the many fjord like bays along the outer coast of the Kenai Peninsula; however, the exposed open waters in the Gulf of Alaska portion of these districts once provided significant portions of the catch. This crab stock has suffered the same severe decline in abundance as have stocks as far east as Yakutat. The fleet in these districts is characterized by both small and large vessels, the smaller boats fishing the bays and the larger ones fishing the bays and the ocean. Poor weather conditions impact all of the boats since the smaller vessels must negotiate open ocean waters to reach gear placed in the bays both east and west of Seward, the port where most of the crabs are delivered. Historical catch since implementation of the minimum legal size in

1976 has ranged from 0.2 to 0.8 million pounds. Vessel effort, only available since 1981, has ranged from 7 to 25 boats (Appendix Table 1).

The regulatory season for the entire management area is from January 15 through March 31. The season may be terminated earlier by Emergency Order. The opening date of January 15 was first implemented in 1987. From 1983 to 1986 and 1972 to 1974 the season opening was November 1. From 1974 to 1983 it was December 1. In the Southern and Kamishak/Barren Islands Districts the Emergency Order is utilized to close the fishery once the guideline harvest level is achieved. The Outer and Eastern Districts close either based on decline in catch per unit of effort (CPUE) or by regulation on March 31.

The Department has been tagging Tanner crabs for the past four years in the Southern, Kamishak Bay and Barren Islands Districts. Thus far there has been no interchange of legal males between the Southern District and the Kamishak/Barren Islands; however, tag recovery has indicated the Kamishak Bay and Barren Islands Districts Tanner crabs are one stock. Furthermore the legal males tagged in these two districts have been captured in Kodiak's North Mainland Section but only as far south as Douglas Reef, which is approximately 5 miles south of Cape Douglas (Figure 1).

Regulations distinctive to the Cook Inlet commercial Tanner crab fishery are:

1) Superexclusive registration.

2) Registration prior to the season opening.

3) Gear storage in the Kamishak and Southern Districts in 15 fathoms or less, except in the eastern portion of the Southern District where it is 10 fathoms or less.

4) A 75 pot limit in the Southern District if the guideline harvest level is greater than 800,000 pounds. A 40 pot limit if it is less.

5) Buoy identification tags are required in the Southern District to assist with the pot limit enforcement.

6) A requirement for two 4 3/4 inch escape rings on all gear.

1990 Season Summary

Only the Kamishak Bay and Barren Islands Districts were opened to commercial and personal use fishing in 1990. Due to continued low stock abundance the Southern (Kachemak Bay), Central, Outer and Eastern Districts were not opened. All districts, including Kamishak Bay and the Barren Islands, were closed to fishing in 1989. This was the first closure since the inception of the fishery in the late 1960's.

Kamishak Bay and Barren Islands Districts

The season opened in these districts by regulation on January 15, 1990. The pre-season guideline harvest range was five to six hundred thousand pounds. Seven vessels registered prior to the January 15 deadline. Keel lengths of the seven participating vessels ranged from 49 to 110 feet with an average of 65 feet.

The season was closed via emergency order effective March 1, 1990. The total delivered catch was 510,034 pounds taken by seven vessels. The justifications for the closure were both anticipated achievement of the guideline harvest range and ice conditions, which would cause gear loss.

If it was not for the exceptionally severe weather this year the seven participating vessels would easily have taken the guideline harvest by mid-February. During the first 15 days of February the boats were able to fish for only two days. Fishing time was restricted by both severe icing and sea conditions. Icing conditions are not unusual in February. According to the Alaska Marine Ice Atlas, published by the University of Alaska, the late January and February period is the most significant for the arctic weather conditions that contribute to increases in ice coverage and thickness.

Fleet catch per unit of effort after the first week of deliveries was 42.9 crabs per pot. As of the final week it was 25.5 crabs per pot.

The average size of the crabs was 145.6 mm (5.73 inches) in carapace width. The average weight was 2.13 pounds per crab.

True recruit crabs (new shells, 140 - 165 mm in width) comprised 50 percent of the catch. Post recruits made up the remaining 50 percent; however, all but one percent of these were skipmolts in the recruit size class. The reason for the relatively large percentage of post-recruits was due to no fishery in 1989; therefore, recruits from 1989 survived to become post-recruits in 1990.

Southern District

The 1989 Department survey of abundance in the Southern District indicated that the stock remains depressed; therefore the season was not opened to either commercial or personal use fishing.

The survey indicated the catchable portion of the male segment of the Tanner crab stock, including legals and sublegals, had declined for the second successive year. The legal index had increased; however, only from a 1988 value of 11.4 crabs per pot to one of 11.9 in 1989. This 0.5 gain indicated that the 1989 recruitment of 2.8 crabs per pot barely replaced the legal crabs that were lost to natural mortality between 1988 and 1989. The 1989 recruitment was a historic low (Figure 4).

Historic index lows not only included the legal male Tanners, but also the sublegals and females. Both true pre-recruit one's as well as total sublegals were at their respective lows (Figure 5). Although the total catch of females was also very poor, these data may not be meaningful to relative stock abundance because the small size of the females permits easy egress from the pots. This fact makes the number of female Tanner captured indicative of abundance in only the grossest sense.

The commercial and personal use closures in 1989 appear to have had a beneficial effect on the reproductive capabilities of the Tanner crabs. Only two percent of the new and old shell females had less than full clutches in 1989 while seven percent were less than full in 1988.

Outer, Eastern and Central Districts

The Central, Outer and Eastern Districts, like the Southern District, were closed to commercial fishing in 1989. The

Department does not survey the Outer, Eastern and Central Districts; however, adjacent districts were assessed. These districts, Western in the Prince William Sound Management Area and Southern in Cook Inlet, both exhibited depressed Tanner crab stocks. The aforementioned, coupled with the historical decline in commercial harvest from the Outer and Eastern Districts, indicate continued low stock abundance.

1991 SEASON MANAGEMENT OUTLOOK

Southern District

The Department will conduct both pot and trawl surveys for Tanner crab in 1990. Based on the number of pre-recruit ones found in the 1989 pot survey it does not appear likely that 1990 recruitment will be sufficient to justify a fishery in the Southern District for 1991. Preliminary analysis of data from a multi-species trawl survey completed by the Department in October 1989 indicated that there were relatively few adult male Tanner crabs. The numbers of Tanners of both sexes began to increase significantly in the 3.0 to 3.5 inch size group. If these data are correct, there will not be any meaningful recruitment into the fishery until in the summer of 1991 or 1992 at the earliest.

Kamishak and Barren Islands Districts

These two districts will also be surveyed in 1990 with both pots and trawls. The number of true pre-recruit ones identified by the 1989 pot survey will likely produce average recruitment at best in 1990. The Department, however, reduced fishing mortality in the 1990 fishery, thereby allowing for a greater percentage of potential post recruits for the 1991 harvest. Therefore average recruitment coupled with a significant number of post recruits,

which survived in 1990 fishery, may provide sufficient legal crabs to allow a limited fishery in 1991.

The aforementioned assumes that recruitment from the pre-recruit one size class will be at least average and not characterized by heavy skipmolting such as was the case in 1989 when approximately 50 percent of the true pre-recruit ones failed to molt. Unfortunately heavy skipmolting of adult males begins in the Kamishak/Barren Islands Districts at sizes smaller than in other adjacent areas such as the Southern District in Cook Inlet and most of the Kodiak area.

The skipmolting phenomenon at smaller sizes also accounts for the smaller average weights and sizes of the legal crabs harvested in the 1990 fishery. For example the average size and weight of the crabs taken in the 1990 fishery were 5.73 inches and 2.13 pounds per crab. This is less than the 1988 Southern and Kamishak/Barren Islands Districts average size and weights of 5.99 inches, 2.46 pounds and 5.85 inches, 2.24 pounds, respectively. The 1990 Kamishak figures are also well below the historical average weights of the Southern and Kamishak/Barren Islands Districts of 2.57 and 2.25 pounds per crab, respectively (Appendix Table 2). Very few survivors of the fishery will molt again to become post-recruits by virtue of both size and age.

Outer, Eastern and Central Districts

The Department does not conduct stock assessment surveys in the Outer, Eastern and Central Districts. As this stock has been on a long, steady decline, there is no reason to expect a miraculous recovery. Surveys in Cook Inlet, as well as adjacent management areas, Prince William Sound and Kodiak, will continue to be

utilized to determine condition of stocks contiguous to the Outer, Eastern and Central Districts. Once these stocks recover, a limited fishery in these districts may be prudent.

Summary

In summation, there is a good chance of another limited fishery in the Kamishak Bay and Barren Islands Districts in 1991. Conversely, survey data indicates a very limited probability of a fishery in the remaining districts. All 1990 Department surveys from Cook Inlet and adjacent areas will be reviewed prior to final determination of the 1991 season.

KING CRAB FISHERY

Introduction

There are two species of king crab found in the Cook Inlet Management Area (H), red and brown. Red is the dominant species with brown found only in a scattered distribution in the outer Gulf of Alaska. Most of the red king crab fishery has occurred either in the Southern District or the Kamishak/Barren Islands Districts. Very little catch has come from the Outer District and none has been documented from the Eastern District (Figure 1).

Earliest recorded commercial landing of king crab occurred in 1937 when crabs were canned at a Halibut Cove packing facility. Commercial fishing for this species remained at a relatively low level through the 1940's. By the mid-1950's harvest levels rose to approximately 2 million pounds per year. During the 1960's fishing expanded to the Kamishak Bay District and boats were harvesting up to 8 million pounds per year. During 1964-65 a significant drop in

catch occurred in the Kamishak District primarily due to lack of processing facilities in the Seldovia area as a result of earthquake damage in 1964. From the late 1960's through 1976 the seasonal catches ranged from 2.5 to 4.8 million pounds. Since that time catches have generally declined (Figure 6 and Appendix Table 3). Due to low abundance the commercial fishery has been closed since the 1981-82 season in the Southern District and the 1983-84 season in the Kamishak/Barren Islands Districts.

The current season opens by regulation on August 1. From 1983 to 1987 the season opening date was July 15. Prior to 1983 the season opened on August 1.

The minimum legal size for all species of king crab is seven inches in carapace width with a provision for an eight inch season. The eight inch season, which was opened and closed by emergency order, has been in effect since 1976. It was used during the 1976-77 season in all districts and during the 1977-78 season in the Kamishak/Barren Islands Districts only. The seven inch minimum legal size has been in effect since 1963.

Cook Inlet is a superexclusive registration area for king crab. The fishery does not currently have a pot limit although a limit of 75 pots was in effect from 1971 through 1978.

1989 Season Summary

Southern District

No king crab harvest has been allowed in the Southern District since the 1981-82 season. Extreme low abundance as well as heavy infestation of egg predators on the female clutches necessitated

maximum protection of the stock. Assessment surveys have shown that the stock remains at a low level therefore not warranting a commercial fishery for the 1989 season.

The 1989 survey clearly indicated that the king crab stock condition in Kachemak Bay is depressed. The 1989 index number is virtually identical to the historical lows of 1982 and 1983. Furthermore, there is no indication of any significant future recruitment. All catchable pre-recruit classes of males and all females are at historical lows (Figure 7).

Only 62 female king crabs were captured, which was 45% of the previous low index taken in 1987. Only two juvenile females were caught. This very low figure for females is comparable to the poor catch of small males.

The relative fecundity of females in 1989 provides the only cause for optimism regarding the future of the king crab stock. The 60% figure is similar to the 64% fecundity of 1988. Both numbers are significant improvements over the 44% and 52% in 1986 and 1987, respectively. These improved fecundity figures may indicate that either the nemertean egg parasite is no longer a problem or that the sex ratio of mature animals is improving. Nevertheless, this does not negate the critical data which shows that the sexually mature segment of the stock is at a historical low with indications of further decline.

Kamishak Bay and Barren Islands Districts

The Kamishak/Barren Islands Districts were first closed to commercial fishing due to low abundance prior to the 1984-85 season. The commercial fishery has remained closed through 1989.

Although the stock is still at a relatively low abundance the 1989 Department survey showed the largest index of legal males since 1981. Half of these legal males were post-recruits, a build-up resulting from the five year commercial fishery closure.

Nevertheless, the continued increase in recruits, pre-recruits and females all indicate a gradual improving king crab stock condition (Figure 8).

Outer and Eastern Districts

Regulatory fishing for brown king crab was permitted coincidentally to the Tanner crab season in the Outer and Eastern Districts in 1988. No fishing occurred due to lack of abundance of this species. Brown king crab have never been found in high concentrations. In 1989 the Tanner season was not opened; therefore, by regulation, a brown king crab season could not be permitted.

1990 Season Management Outlook

Southern District

The Department will conduct its annual Southern District king and Tanner crab survey in June and July of 1990. The survey in June will be with pots and the one in July will utilize a trawl. It is doubtful that the results from this assessment will indicate any significant increase in the legal segment of the stock, thereby justifying opening of both the commercial and personal use fisheries.

Kamishak Bay and Barren Islands Districts

The numbers of pre-recruits caught in recent surveys do not indicate that these year classes will provide the recruitment necessary to justify a commercial harvest in 1990. The Department will conduct the 1990 survey in June with pots and again in July with a trawl. The June pot survey is the traditional survey regarding gear and timing. All crab surveys in the Cook Inlet Management Area will be converted to trawls in 1990. This will necessitate dual pot and trawl surveys for at least one year so that historical pot survey data may be compared to future trawl survey information.

Outer and Eastern Districts

These districts will remain closed to the harvest of red king crabs until the stock in the remainder of the Cook Inlet Management Area recovers. Permits for brown king crab will be issued only if the Tanner crab season is opened.

Summary

The condition of the red king crab stock in the Southern District is severely depressed. Although the fecundity of the females is improving, the overall numbers of catchable crabs is at a historical low. It does not appear that either a commercial or personal use fishery is likely at least for another three or four years or more.

Conversely the red king crab stock in the Kamishak/Barren Islands Districts indicates a commercial season may occur in the foreseeable future. Continuation of the gradual stock improvement may soon provide biological justification for a limited commercial fishery. Improved Department survey coverage in itself may yield

the data necessary to have a restricted harvest; however, the staff is exploring the possibility of a test fishing project in conjunction with the commercial industry once the Department's own survey indicates a harvestable surplus of crabs exists.

Beginning a commercial fishery once again will contain some risk of premature harvest thus retarding the stock's recent improvements. A combination of factors such as the August 1 opening when the weather is still relatively good, and the possibility of being the only king crab fishery open in which a small to medium size vessel can participate, may easily result in a large amount of gear on the grounds. One lift of a large number of pots from a large number of boats could result in a fishing mortality too high for a recovering stock. One solution to this would be to delay the fishery until it appears that the stock abundance could withstand a harvest from any conceivable effort level. This could take a number of years. Another solution to the problem would be to limit the effort either via limited entry, an enforceable pot limit or a combination of both.

DUNGENESS CRAB FISHERY

Introduction

The majority of the commercial and personal use Dungeness crab fishing in Cook Inlet has occurred in the Southern District (Figure 1), which includes Kachemak Bay. During the 1960's and early 70's commercial catch and effort were often functions of market conditions as opposed to availability of the resource. Catch and effort increased significantly in 1978 to 1.2 million pounds taken by 49 vessels. Subsequently, favorable market conditions and the need of fishermen to find alternative fisheries have kept effort

high. Since 1978 annual harvests have ranged from a low of 178,064 pounds in 1989 to a high of 2.1 million pounds in 1979, while effort has ranged from 43 vessels in 1989 to 108 vessels in 1982 (Appendix Table 4). Since 1979, 92 percent of the crabs have been harvested between the months of June and October (Figure 9).

Biological regulations for the commercial Dungeness fishery consist of a males only harvest and a minimum carapace width of 6.5 inches (165 mm). Regulations which are specific to the Cook Inlet management area are as follows:

1) A regulation adopted by the Board of Fisheries in 1986 which closes Area H to Dungeness fishing during the 15 day period prior to the opening of the Tanner season, allowing for the removal of delinquent gear and a fair start for the Tanner crab fishery.

2) Closure of Southern District waters in depths of 10 fathoms or less from January 15 through April 30.

3) A 150 pot limit in the Southern District.

4) A gear regulation which requires consecutive numbering of all buoys.

Although some level of fishing occurs throughout the year, effort increases significantly after the major molt due to the availability of the new recruit crabs. The peak molting time for adult males in Kachemak Bay can occur from late April through mid-September in any given year. In some years the molt may occur in May and June, in others in June and July, and in still others from July to September. The molt is stimulated by water temperature and physiological condition of the crab. The inconsistency in molt

timing among years is partially explained by the significant annual spring-summer temperature variation in the shallower north temperate and sub-arctic waters of Alaska.

Within Kachemak Bay itself, molting generally occurs somewhat earlier in the waters east of Homer Spit than in the waters west of the Spit, where the influence of Cook Inlet proper is much greater. Newly molted legal crabs often appear in the catches west of Homer Spit one month or more after appearing east of the Spit. Crabs east of Homer Spit are most likely resident from the first post-larval instar up to legal size. Those legal crabs captured west of the Spit, however, may actually be reared as juveniles in the waters of Cook Inlet north of Anchor Point. Catches of small crabs by upper Cook Inlet salmon set netters and casual observations of molted exoskeletons from the general public indicate significant numbers of Dungeness reside in upper Cook Inlet.

Ninety percent or more of the Dungeness fleet are residents of Kachemak Bay communities of Homer and Seldovia. The fishing vessels are in the 40 foot size class and smaller. Smaller vessels without circulating tanks generally fish the waters east of Homer Spit while larger vessels with circulating tanks fish the deeper somewhat rougher waters west of the Spit.

1989 Season Summary

The total 1989 Dungeness crab harvest for the entire Cook Inlet Management Area was 178,064 pounds taken by 43 different vessels (Table 2). Twelve thousand and eight pounds were utilized in the sea otter rehabilitation project, which was a result of the Exxon Valdez oil spill. Catch for the Southern District was 170,266 pounds from 41 vessels, while the remaining 7,798 pounds were harvested in the Central District by two vessels. Ninety percent of the total catch was taken between June and September (Table 3).

A breakdown of the Southern District catch by area showed that 98,215 pounds (55 percent) were caught east of Homer Spit while the remaining 72,051 pounds (45 percent) came from the area west of the Spit. Overall average catch per unit of effort (CPUE) for the Southern District was 2.0 crabs per pot, with a 1.6 and 3.4 crab per pot average for the areas east and west of the Homer Spit, respectively (Table 4).

Dockside sampling data indicated that approximately 65 percent of the catch were true recruits, or new-shelled crabs ranging from 165 to 189 millimeters in carapace width. Post-recruits, by virtue of size (190 - 214 mm), represented slightly more than 24 percent of the catch, while skipmolts in the recruit size class represented 11 percent of the catch. The average carapace width of all crabs sampled was 180.7 millimeters (7.11 inches), while the average weight was 2.12 pounds.

Six different processors purchased Dungeness crab caught in the Cook Inlet area: three in Homer and one each in Anchorage, Kenai and Ninilchik. Sixteen catcher/sellers caught and sold their own crabs. The price paid for Dungeness averaged $1.28 per pound over the entire year, with those crabs caught west of Homer Spit bringing a slightly higher price than those east of the Spit due to a cleaner and lighter external appearance, rendering these crabs more marketable on the whole cook and section market. The estimated ex-vessel value for the 1989 harvest was $230,000.

The annual enforcement effort for delinquent Dungeness gear, which recently has occurred during the 15 day Dungeness closure prior to the Tanner crab season at the beginning of January, did not take place during 1990. In order for the Dungeness closure to be executed there must be a commercial Tanner crab season; the Tanner crab season was not opened in the Southern District in 1990. Ordinarily some of the Dungeness gear, whether lost or

intentionally left on the grounds, has been picked up during the January closure. Although no documentation was made relative to number of crabs, observations of absence or presence indicated that this gear traps and retains not only Dungeness crabs but Tanners and king crabs as well.

1990 Management Outlook

The 1990 Dungeness crab fishery in Cook Inlet will again be entirely dependent on recruitment. The fishery will continue to be characterized by heavy effort relative to the amount of available crabs.

The Department does not conduct any Dungeness assessment surveys in Cook Inlet; therefore no forecast of recruitment or projected harvest are made.

Two major problems identified in this fishery persist:

1) Depression of the stock due to handling and trapping mortality because fishing occurs during and immediately after the molting period.

2) Violation of the 150 pot limit by a portion of the fleet.

Fishing during and immediately after the major molting period for adult males played a significant part in the recent record low Dungeness crab harvest of 178,064 pounds taken in 1989 (Figure 10). Although large annual catch fluctuations seem to be characteristic of the developed Dungeness crab fisheries in Washington, Oregon and California, there is one critical difference between these fisheries and the one in the Southern District (Kachemak Bay) of the Cook Inlet Management Area: the majority of the Dungeness seasons in the Lower 48 do not occur during the major molting period of the adult males. This currently is and has been the case

in Cook Inlet since the inception of the fishery. Mortalities associated with handling and trapping may not have been significant during the 1960's and early 70's when effort levels were low and stock abundance was high; however, since then the level of fishing has accelerated not only in amount of vessels and pots, but also in the amount of time each year that the gear is deployed.

The Department does not have enough hard evidence via direct sampling of soft shell crabs to prove that the major molt of catchable males occurs during the summer months. Indirect evidence, such as dramatic increases in the catch, which is largely composed of new shell crabs, and documented molt timing in other areas of Alaska, are substantative enough to convince the staff that the molt of most mature males is a summer event. Thus far the industry has generally rejected any suggestion by the staff to curtail summer fishing.

In Cook Inlet the Dungeness fishery has evolved into a summer fishery for the following reasons:

1) The crabs recruit into the fishery during the summer months.

2) Salmon fishermen are occupied with salmon fishing, thus creating a niche for fishermen who do not hold permits for limited entry fisheries.

3) The weather is better.

4) The catcher/seller sales to the tourist industry are at their peak.

In 1989, the State of Washington and the commercial fishing industry conducted a joint test fishing effort to avoid opening a commercial fishery when the Dungeness crabs were in a soft shell

condition. Suggestions of this nature have not been positively received by the Cook Inlet Dungeness crab fishing industry.

AREA H TRAWL SHRIMP FISHERY

Introduction

Cook Inlet is separated into two shrimp registration areas as shown on Figure 2: Area H (Southern, Kamishak, and Barren Islands Districts) and Area G (Outer and Eastern Districts). Historically the primary trawl shrimp fishery has occurred in the Southern District of Area H.

The Area H trawl shrimp fishery has occurred within Kachemak Bay and is characterized by super-exclusive registration and definitive management under the Kachemak Bay Trawl Shrimp Management Plan. This plan has three basic features:

1) An annual guideline harvest level determined from stock assessment surveys.

2) Annual harvest spread out over the entire fishing season utilizing three separate regulatory sub-seasons.

3) Sub-season harvest spread out by having equal weekly guideline harvests.

Such characteristics allow practical use of fishery performance as an in-season management tool and maximize monitoring of the shrimp stock status throughout the year in an attempt to avoid overfishing. Also, two areas closed to trawl shrimp fishing are maintained throughout the year (Figure 11): the first includes the majority of upper Kachemak Bay east of Homer Spit, originally established because this area consistently contained small,

juvenile pink shrimp; the second includes Tutka Bay and Sadie Cove, established because the staff felt the small area encompassed lent itself to the potential of overharvest.

Commercial trawl shrimp harvests in Kachemak Bay reached the five million pound level in the late 1960's and remained near that level through the early 1980's (Appendix Table 6). Effort has varied from a low of one vessel during 1968 to a high of 23 in 1981. Prior to 1983, most commercial harvest and effort occurred west of Homer Spit, but between 1983 and 1986 virtually all effort shifted to the area east of the Homer Spit.

Pink shrimp (Pandalus borealis) historically made up the bulk of the commercial catch, with sidestripes (Pandalopsis dispar) seasonally making up a lower but often significant portion of the catch. Humpy shrimp (Pandalus goniurus) have at times comprised up to half of the harvest, but this species appears to undergo the most erratic population fluctuations and their contributions to the most recent fisheries have been negligible. Finally, coonstripe shrimp (P. hypsinotus) consistently made up less than five percent of the catch.

The Department's two yearly index of abundance surveys, which determine each season's guideline harvest level, have indicated a significant decline in abundance and distribution of all Pandalid shrimp stocks in Kachemak Bay since the late 1970's (Appendix Table 7). This decline led to a decreased harvest guideline of 3.0 million pounds in 1982-83 and a closure of two sub-seasons during 1983-84. When the fishery reopened in the winter of 1984, the guideline harvest levels were further reduced to 1.5 million pounds annually. Fishing was again closed in the fall of 1986 due in part to a continued low abundance of all shrimp as evidenced by the surveys and a high percentage of small pink shrimp in both the commercial and survey catches. The fishery has remained closed since the fall 1986.

In an effort to obtain better and more accurate information on the shrimp stocks in Kachemak Bay, the index of abundance surveys were expanded in 1988 to include more sampling stations east of the Homer Spit. The Department felt the better coverage of that area, where the majority of shrimp are caught, could only enhance the Department's ability to make decisions regarding openings and closures. Because the new stations have only been in place for a short time, these stations are not utilized in any of the published calculations for estimates of abundance, but rather are used for comparative purposes at this time.

1989-90 Season Summary

The first Department survey of 1989 occurred during the month of May. Results of that survey indicated a decrease in estimated abundance of shrimp in Kachemak Bay since the fall survey of 1988, from 2.5 to 1.5 million pounds (Appendix Table 7), the lowest midpoint estimate in the survey's history. As has been the case during recent years, the majority of shrimp caught during this survey came from the area north and east of Glacier Spit (commercially closed area). Count per pound (Appendix Table 9) and length frequency data suggested that the pink shrimp from this area were predominantly juveniles and males, yet these animals were slightly larger than those seen in recent years' spring surveys. West and south of Glacier Spit, catches of shrimp were some of the lowest ever recorded by the surveys, with the majority of pink shrimp consisting of females and transitionals. West of Homer Spit, the overall geographic distribution of shrimp was similar to recent surveys, limited to a few stations north and west of Yukon Island, but total catches were once again very small. Abundance of fish was high in all areas sampled. All information collected during this survey indicated that the Pandalid shrimp stocks had actually decreased in overall abundance and the reproductive capability of the stocks, particularly pinks, remained extremely

depressed due to low numbers of females. Therefore, the Department issued Emergency Order No. 2-S-H-03-89, closing the Kachemak Bay trawl shrimp fishery for the entire 1989-90 fishing season.

The fall survey of 1989 was conducted during the latter part of September. Results of the survey yielded the lowest midpoint of the abundance estimate, 1.4 million pounds, ever recorded in the index program. Once again the bulk of the survey catch came from the area north and east of Glacier Spit. Shrimp catches in the open area west and south of Glacier Spit, however, were higher than the spring survey, indicating a slight change in geographic distribution of the shrimp since that survey. Catches of shrimp west of Homer Spit were negligible increases over the spring survey. Fish catches from all areas were at or near record highs. The Department still felt that any fishing mortality on the shrimp stocks would be detrimental to reproductive success because many females would be taken, further justifying the closure announced after the spring 1989 survey.

Current environmental factors, such as (but not limited to) water temperature and food availability, as well as large populations of predator species such as Pacific cod (Gadus macrocephalus), walleye pollock (Theragra chalcogramma), and Pacific halibut (Hippoglossus stenolepis), may be the most important elements influencing stocks of shrimp in Kachemak Bay. Regardless of cause, the shrimp stocks decreased in 1989 compared to recent years. Fish abundance levels remained extremely high. In an effort to enhance growth and reproduction in the shrimp stocks, the Department had little alternative than to curtail commercial fishing for the entire fishing year.

1990-91 Management Outlook

The spring survey of 1990 will indicate any changes in the stocks that may have occurred since the fall 1989 survey. A decision to reopen commercial fishing for the upcoming regulatory year beginning July 1 will rest primarily on the results of that spring survey. Based on the known life history information regarding growth and age of shrimp, the Department has seen no definitive or convincing evidence to allow any commercial trawl shrimp fishing in Kachemak Bay during 1990-91.

AREA G TRAWL SHRIMP FISHERY

Introduction

Area G is a non-exclusive shrimp registration area, encompassing the Outer and Eastern Districts of Cook Inlet (Figure 2), established by the Board of Fisheries in the spring of 1977. The first year of significant harvest occurred in the 1982-83 season when four vessels harvested 239,584 pounds (Appendix Table 10). The catch increased steadily for the next two seasons to a peak harvest of just under 2.0 million pounds taken by 11 vessels during the 1984-85 season. A regulatory season for trawl shrimp fishing was adopted by the Board for Area G in the spring of 1985, beginning June 1 and ending February 28.

Although surveys are not conducted in Area G, the stocks there have never been considered dense. In the very early years of this fishery, with virgin stocks, trawl CPUE was never high, rarely approaching 1,000 pounds per hour. Logbook information collected over time indicates that fishermen in Area G must make long tows, often with extremely low catch results.

1989-90 Season Summary

The Area G season opened on June 1, 1989, but no effort occurred during the entire open season which ended on February 28, 1990. The most likely reason for the lack of effort in Area G was that the market for pink shrimp has been depressed in recent years and there were probably no active buyers in Kodiak, where the majority of Area G pink shrimp are sold. Although some trawl effort has been directed specifically at sidestripe shrimp in the past, it is unclear why no effort was directed at this species during 1989/90.

1990-91 Management Outlook

No population abundance index surveys are planned by the Department for any portion of Area G. Therefore, the commercial fishery is the sole source of information concerning stock status. The low historical fishery performance in terms of catch per unit of effort would suggest low abundance levels of pink shrimp. Fishermen can sometimes overcome the low catch rates if they can locate and harvest a higher percentage of larger shrimp, such as sidestripes, and subsequently receive a higher price for the product, an event which occurred on a small scale in 1988-89. However, both the abundance and the location of these more valuable species seems to be inconsistent from year to year, therefore making it difficult to target on these individuals.

Although no specific management strategy exists for Area G beyond the implementation of a biological season, the Department will continue to collect logbooks from vessels fishing the area and will monitor catches through fish ticket information and log book analysis. Harvest and effort in Area G could increase in future years if the market for sidestripe shrimp continues to grow and if more vessels become efficient at targeting on this particular species.

AREA H POT SHRIMP FISHERY

Introduction

Similar to trawl shrimp, the Cook Inlet Management Area is separated into two separate registration areas for pot shrimp: Area H, consisting of the Southern, Kamishak, and Barren Islands Districts; and Area G, consisting of the Outer and Eastern Districts (Figure 2). Traditionally the major pot shrimp fishery has occurred in the Southern District.

Pot shrimp fishing in Kachemak Bay of the Southern District is primarily done by small vessel fishermen that develop their own markets. The target species is the coonstripe shrimp, the most abundant pot shrimp species in Kachemak Bay. Spot shrimp (Pandalus platyceros) also occur in the bay but their contribution to the fishery is generally negligible. Each regulatory fishing season, which begins June 1 and ends March 31, is managed via three separate sub-seasons with appropriate guideline harvest levels set for each sub-season. Prior to 1986, guideline harvest levels were determined by the Department's two annual pot shrimp surveys as well as by voluntary commercial fishery performance information. All pot shrimp surveys have been eliminated in the Cook Inlet Area. Fishery performance data in the form of voluntary logbooks was collected consistently during 1986 and 1987 and was the sole criteria used to judge stock status. This information, along with that from the most recent Department trawl surveys, suggests that stocks of pot shrimp in Kachemak Bay continue to be depressed. Commercial catch figures show that recent year' harvests are well below those of the 1970's and early 1980's (Appendix Table 11).

Logbook and catch information from the fall 1987 sub-season, as well as the results from the fall 1987 trawl survey, indicated that the pot shrimp stocks were at very low levels. As a result, the

commercial pot shrimp fishery was closed in mid-November for the remainder of the 1987-88 fishing season. The 1988-89 season was allowed to open by regulation in June, 1988, but a limited amount of in-season fishery performance figures, combined with pre-season results from the spring 1988 trawl survey and information from Personal Use pot shrimp fishermen, all showed the levels of pot shrimp abundance to be at perhaps the lowest levels ever in Kachemak Bay. As a result, the fishery was closed, after only 22 days and a harvest of 5,323 pounds, for the remainder of the 1988-89 season.

1989-90 Season Summary

With no assessment survey specifically directed at coonstripe shrimp in Kachemak Bay, and with no commercial pot shrimp fishery, the Department relied on data obtained in the spring 1989 trawl survey and information from Personal Use fishermen. Results from the spring survey indicated an average catch of 3.9 pounds of coonstripe shrimp caught per one nautical mile towed east of the Homer Spit, and an average of 15.5 pounds of coonstripes per nautical mile in the Tutka Bay/Sadie Cove area. These figures, from the two primary pot shrimp production areas in the commercial fishery, were the lowest survey figures of the 1980's. Voluntary information offered by Personal Use fishermen in both 1988 and 1989 indicated very poor catches when compared to historical averages. In addition, nearly every individual Personal Use fisherman commented on the small size of the coonstripes caught.

Based on this information, the Department felt the coonstripe shrimp stocks in Kachemak Bay to be depressed, therefore no commercial fishing pressure was warranted. Emergency Order No. 2-S-H-02-89 closed the pot shrimp fishery for the entire 1989-90 season.

1990-91 Management Outlook

All information collected during 1989 indicated that stocks of Pandalid shrimp continue to be depressed in Kachemak Bay. Prior to the 1990 regulatory opening, information from the May 1990 trawl shrimp survey and from any Personal Use shrimp fishermen will be reviewed. Should stock status be evaluated as still depressed, the commercial fishery will not be opened. In that instance, the fishery would be closed for the entire fishing year in order to facilitate growth, recruitment, and reproduction in the pot shrimp stocks.

The life history for coonstripes in the more temperate Pacific waters of Canada has been documented at about four years (Butler, 1980). Although no information exists specifically for the coonstripe shrimp in Kachemak Bay, the life cycle in these more northerly waters is probably a minimum of six years. This phenomenon of slower growth and longer life cycles for shrimp in more northerly latitudes has also been demonstrated in pink shrimp. Olson (1975) found the minimum life cycle of these smaller Pandalids to be five years in Kachemak Bay, whereas Butler (1980) documented a maximum life cycle of four years in British Columbia. It is therefore unlikely that the stocks of coonstripes could recover to a level of significant abundance in just one year. Based on this information, data gathered from both the trawl index surveys and the Personal Use fishery must clearly indicate a resurgence of the coonstripe shrimp stocks in Kachemak Bay before the Department would allow a commercial fishery to occur.

AREA G POT SHRIMP FISHERY

Introduction

Area G, also known as Outer Cook Inlet, includes the Outer and Eastern Districts (Figure 2). Currently there are no closed season or biological regulations governing the pot shrimp fishery. The target species is the spot shrimp. Since 1977, catch and effort have remained low, never exceeding a reported annual harvest of nearly 19,000 pounds whole weight caught by 13 participating vessels in 1983 (Appendix Table 11). Despite the extensive coastal area, historical information collected from this fishery suggests that the stocks of shrimp here occur within some (but not all) bays and are of limited abundance.

1989 Season Summary

The commercial season began by regulation on January 1, but actual effort began when one vessel started fishing in February. Oil spilled from the T/V Exxon Valdez in Prince William Sound during March had spread into Area G by April. Initially the area was allowed to remain open because of the low effort level and because no oil had been documented near the areas of fishing activity. In late April, oil was documented on the fishing grounds, including Nuka Bay, Port Dick, Aialik Bay, and Resurrection Bay. With summer approaching, additional vessels were expected to enter this fishery. Therefore, in order to prevent wastage of shrimp and loss of gear due to oil contamination, and to promote an orderly fishery, the pot shrimp fishery in Area G was closed via Emergency Order No. 2-S-H-01-89, effective at noon on April 30, 1989. Through that date, a total of four different vessels landed 9,878 pounds of shrimp, whole weight. Of this total, 8,292 pounds

(83.9%) consisted of spot shrimp, 986 pounds (10.0%) coonstripe shrimp, and 600 pounds (6.1%) spot shrimp deadloss due to oil contamination.

Aerial monitoring of Area G indicated a reduced but still significant amount of oil on May 22. A subsequent aerial survey conducted on June 6 indicated no visible surface oil in the areas of the bays where pot shrimp fishing normally occurs. Observations throughout the remainder of June by the ADF&G staff revealed no significant surface oil except in nearshore intertidal areas. Since the pot shrimp fishery occurs offshore in deeper waters of the aforementioned bays, Area G was reopened to commercial fishing by Emergency Order No. 2-S-H-04-89, effective at noon on July 7.

The Area G pot shrimp fishery remained open through the rest of the calendar year, but actual effort continued only into October. During the July-October period, four different vessels harvested 10,622 pounds of shrimp: 9,890 pounds (93.1%) spot shrimp, 727 pounds (6.8%) coonstripes, and 5 pounds (<0.1%) pink shrimp. This brought the total year's harvest to 20,500 pounds, a new Area G high, from 8 different vessels, broken down as follows: 18,182 pounds (88.7%) spot shrimp; 1,173 pounds (8.4%) coonstripe shrimp; 5 pounds (<0.1%) pink shrimp; and 600 pounds (2.9%) spot shrimp deadloss (Table 5). At an approximate average price of $3.00 per pound for all shrimp, the estimated ex-vessel value of this fishery was $60,000. CPUE information, obtained from fish tickets, showed an overall season average of approximately 1.2 pounds per pot, unadjusted for soak time.

1990 Management Outlook

Other than collection of fish ticket information, there is no particular management strategy employed for Area G pot shrimp. At

this time, the harvest and effort are not expected to increase dramatically in the near future.

Catch reporting accuracy is unknown for Area G pot shrimp due to a lack of any enforcement effort. Since there is no longer a Department office in Seward, and since there is little chance of ever being cited for violations, some fishermen may not bother to report their catches at all. Therefore historical catch figures are only those reported to the Department on fish tickets and may not truly represent the actual harvest from Area G.

SCALLOP FISHERY

Introduction

The commercial scallop fishery in the Cook Inlet Management Area (H) began in 1983 although sporadic interest had occurred prior to that time. The Alaska Board of Fisheries responded to a public proposal in 1983 by directing the Department to allow restricted "exploratory" fisheries in 1983 and 1984. These initial fisheries were characterized by low effort due to severe permit restrictions when compared with traditional scallop fisheries both inside and outside Alaska. The most important restrictions were:

1) Legal gear limited to a six-foot wide dredge with minimum ring size of four inches inside diameter.

2) Only one unit of gear allowed on board at any one time.

3) Mandatory log book completion.

4) Contact with the Homer office prior to and at the completion of each trip.

5) An agreement to carry Department observers on board if requested.

The target species of the fishery is the Pacific weathervane scallop. Except for some brief exploratory fishing in the Kamishak District in 1984 and in the Outer District in 1987, a single bed of scallops near Augustine Island in the Kamishak District has sustained virtually the entire harvest since the fishery began. The Department conducted an assessment survey in August, 1984, using the state vessel R/V PANDALUS, to better define the extent of this particular bed and to aid in establishing appropriate harvest levels. Based on information from this survey as well as data from the initial fisheries, the Board of Fisheries adopted regulations for scallops in Cook Inlet in 1985. These regulations included a season in the Kamishak District from August 15 through October 31, a guideline harvest level of 10,000 to 20,000 pounds of shucked meats, and the restrictions mentioned above. The Southern District was not opened to scallop fishing in order to protect crab stocks while the Outer and Eastern Districts were opened year round to encourage exploratory fishing. Commercial fishery performance has been used in-season to adjust guideline levels. Appendix Table 12 shows the historical scallop harvests and effort in Cook Inlet.

At the start of the 1987 fishery, several experienced participants demonstrated extremely poor fishery performance during their first trips to the traditional Kamishak bed. Realizing that this bed is limited in size, and that the recovery rate for heavily exploited scallop stocks in Alaska is slow, the Department was compelled to close the Kamishak District scallop fishery less than one week after it opened that year. The significant reduction in CPUE demonstrated in the 1987 fishery compared to previous fisheries occurred over only one year's time and appears to have been the

result of illegal fishing activity which probably occurred during the fall months of 1986 and winter months of 1987. In an attempt to address the potential problem of illegal fishing, the Department required scallop vessels transitting the Cook Inlet area to be inspected prior to and immediately after entering and leaving the area. This requirement may have been implemented too late, however, and the majority of illegal activity may have already occurred. No commercial effort occurred in Cook Inlet during 1988.

1989 Season Summary

Scallop regulations and harvest guidelines adopted in 1985 remained in effect through 1989, with the exception that the harvest guideline range was zero to 20,000 pounds. As has been the case during recent years, the Department intended to closely monitor fishery performance in the Kamishak District in order to justify continued fishing or closure of the fishery. No permits were issued for any district in the Cook Inlet area in 1989, subsequently no effort or harvest occurred.

1990 Management Outlook

Without a commercial fishery and CPUE data, the Department has no means by which to judge the health of the scallop resource in the Kamishak District. Therefore, the Department will allow the 1990 scallop season there to open by regulation on August 15 with a zero to 20,000 pound guideline harvest level. Vessel logbooks and skipper interviews will be closely scrutinized early in the season to see if the fishery performance justifies continued fishing, and a closure will occur should the Department feel that the stock is jeopardized. In addition, the Department will continue to require scallop vessels fishing other areas to receive hold inspections prior to and immediately after entering and exiting the Cook Inlet

Area. Vessel effort is once again expected to be low in all districts of the Cook Inlet area during the 1990 season. Based on available growth and recruitment information, the recovery of the Kamishak scallop bed under ideal conditions would probably begin to occur in a minimum of three years with at least five or seven years time needed to re-establish a multiple age structure and sufficient abundance to support any significant commercial effort.

HARDSHELL CLAMS AND MUSSELS

Introduction

Very little documented commercial hardshell clam or mussel harvest information exists for the Cook Inlet Management Area prior to 1986. There are currently no closed season, size limit, or closed area regulations for harvesting with shovels and forks. A Commissioner's permit is required to use hydraulic diggers.

In order to utilize commercially taken clams or mussels for human consumption, the beach from which these species are harvested must be certified by the Alaska Department of Environmental Conservation (ADEC) as being free of the dinoflagellate responsible for Paralytic Shellfish Poisoning (PSP) as well as other pollutants or contaminants. While a limited market for butter clams (Saxidomus giganteus), Pacific little neck clams (Protothaca staminea), and blue mussels has existed for some time, there were few beaches certified by ADEC. A limited amount of hardshell clams were harvested in Chinitna Bay in 1985 after the area was certified for lot sampling by ADEC, and in 1986 ADEC permitted the use of a lot sampling plan for Bear Cove in Kachemak Bay.

Between 1986 and 1988, annual harvest of clams in Cook Inlet has ranged from 14,449 pounds to 17,303 pounds (Appendix Table 13), all

hand-dug by two to eight permit holders and the majority from the Bear Cove area. Harvest of wild stocks of blue mussels in Cook Inlet during this time has amounted to 102 pounds taken in 1987. At the present time, Chugachik Island (Bear Cove), Halibut Cove Lagoon, Kasitsna Bay, and Jakalof Bay, all in the Southern District (Figure 12), are beaches from which ADEC is accepting lot samples to test for PSP and other contaminants.

1989 Season Summary

Harvest of Cook Inlet hardshell clams and mussels in 1989 occurred from January through August (Tables 6 and 7), all hand-dug in the Southern District. From January through March, a total of 2,911 pounds of clams were harvested by five permit holders for human consumption, while 1,975 pounds of blue mussels were harvested by one permit holder during this time, also for human consumption. Of the clams during this period, 2,584 pounds (88.8%) were Pacific little necks and 327 pounds (11.2%) were butter clams. During May, an additional 1,600 pounds of cockles (Clinocardium nuttalli) were directed into the bait market by one permit holder.

The oil spilled from the T/V Exxon Valdez in March resulted in the formation of "otter rehabilitation centers" in various places around the Gulf of Alaska, including one in Kachemak Bay. This created a new and short-term demand for a significant amount of hardshell clams and, especially, blue mussels to be used as otter food. Beginning in June, the entire Cook Inlet hardshell clam and mussel harvests were channelled into the Kachemak Bay otter rehab center. The human consumption market was effectively abandoned in favor the much more lucrative otter food market.

From June through August, 1989, 15,329 pounds of hardshell clams were harvested by four permit holders for otter food. This total consisted of 13,348 pounds (87.1%) of butter clams and 1,981 pounds

(12.9%) of cockles. Also during that period, nine permit holders harvested 165,268 pounds of blue mussels as otter food. This brought the total 1989 harvest to 13,675 pounds of butter clams, 3,581 pounds of cockles, 2,584 pounds of Pacific little necks, and 167,243 pounds of blue mussels. Broken down by markets, 77.3 percent of the hardshell clams were sold as otter food, 14.7 percent for human consumption, and 8.0 percent for bait. For blue mussels, 98.8 percent went to the otter rehab centers while only 1.2 percent was sold for human consumption. The estimated ex-vessel value for the Cook Inlet hardshell clam and mussel fishery was approximately $278,000. There were no applications for the use of hydraulic diggers during 1989.

1990 Management Outlook

Market demand and economics will probably play the biggest role in determining the 1990 Cook Inlet clam and mussel harvests. Barring another unforeseen disaster, the hardshell clam harvest for 1990 will probably be similar to recent years' harvests, while the blue mussel harvest is expected to be significantly lower than the 1989 total. The Bear Cove and Kasitsna/Jakalof Bay areas are again expected to produce the majority of the hand-dug hardshell clam and mussel harvests in Cook Inlet. Hydraulic dredge effort is unknown for 1990 at this time.

The Department in 1989 initiated a small scale program to test the feasibility of assessing the clam and mussel stocks in Cook Inlet. The data and specimens collected during this work have yet to be analyzed, so no results are available. However, some analysis of these samples is expected to occur prior to the spring 1990 Board of Fisheries meeting and results will be made available at that time. Additional data may also be available from a separate bivalve research project that is occurring in Cook Inlet as well as Prince William Sound and Kodiak.

RAZOR CLAMS[a]

Introduction

Razor clams are present in many areas of Cook Inlet with particularly dense concentrations occurring near Polly Creek on the western shore of the Central District and from Clam Gulch to Ninilchik on the eastern shore of this district (Figure 1). The eastern shoreline has been set aside exclusively for sport harvest since 1959. All commercial harvests since that time have come from the west shore, principally from the Polly Creek/Crescent River beach, the only such area in Cook Inlet certified by the Alaska Department of Environmental Conservation for human consumption harvest. No size restrictions or overall harvest limits are in place for any area.

The majority of commercially harvested razor clams in Cook Inlet have been hand-dug, but current regulations also allow the use of hydraulic diggers (dredges) in certain areas. These areas include the west side of Cook Inlet between Spring Point and Cape Douglas, and also a one and one-half mile section of the beach south of Polly Creek on the west side of Upper Cook Inlet. A commissioner's permit must first be obtained prior to taking clams with a dredge. The application for this permit specifies the intended location of operation, the proposed duration of operation, and detailed specifications of the gear. Upon approval, this application results in a "provisional permit" with the above restrictions as well as a requirement specifying a maximum breakage rate of ten percent. Before issuing the final permit, the Department must physically inspect the dredge while in actual operation and certify

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[a]Information for the 1989 razor clam fishery in Cook Inlet was provided by Paul Reusch, Area Management Biologist, Div. of Commercial Fisheries, Soldotna.

that the breakage falls within these limits. Additionally, the Department may re-inspect the dredge at any time during the specified permit period, and failure to meet the maximum breakage requirement could result in termination of the permit. Although numerous attempts have been made to develop a feasible razor clam dredging operation in Cook Inlet, most have been largely unsuccessful due to excessive breakage and/or the limited availability of clams in the areas open to this gear type.

Since 1919, commercial razor clam harvest levels in Cook Inlet have fluctuated from no fishery for as many as eight consecutive years to production in excess of half a million pounds (live weight) in 1922 (Appendix Table 14). The sporadic nature of the fishery has been a function of effort and market opportunities rather than limited availability of the resource.

1989 Season Summary

The 1989 razor clam fishery occurred between May and early September with the bulk of the harvest taken between June and August. The total harvest of 222,747 pounds of razor clams, consisting of 188,765 pounds (84.7%) utilized for human consumption and 33,982 pounds (15.3%) for bait, was entirely hand-dug by 32 permit holders. All the harvest came from ten miles of the Polly Creek/Crescent River certified beach. There were no applications for provisional permits for dredging operations in 1989. Total ex-vessel value of the 1989 fishery was approximately $210,000. Both the number of diggers and the total poundage harvested were decreases over 1988.

1990 Management Outlook

The 1990 Cook Inlet razor clam harvest is expected to be similar to recent seasons with an anticipated total of 200,000 to 350,000 pounds taken. Hand-digging effort is expected to range from 30 to 60 individuals, depending on the number of companies buying the product, while dredge effort is expected to remain low. The Department intends to continue to issue permits and monitor the catch through fish tickets as in the past.

OCTOPUS

Introduction

The harvest of octopus in the Cook Inlet area has historically occurred incidentally in other directed fisheries such as the commercial Tanner crab fishery. Appendix Table 15 shows the historical Cook Inlet octopus harvets, records for which have been kept only since 1986. An increased amount of interest in directing effort specifically towards octopus has occurred in recent years, but actual effort has been negligible.

There are no closed seasons or size limits on octopus at the present time, but a permit is required prior to fishing a given registration area. Cook Inlet permit restrictions include short permit duration (typically one to four months), strict reporting requirements, and a detailed description of gear to be utilized. This last requirement is necessary to prevent gear legally defined as king, Tanner, Dungeness, or shrimp pots from being used to capture octopus, in order to prevent fishing for those species during closed periods under the guise of octopus fishing.

Additionally, this requirement will help to eliminate the incidental by-catch of king and Tanner crabs, stocks of which are both currently depressed in the Southern District.

1989 Season Summary

During 1989, only one permit was issued to an individual specifically targeting on octopus in the Southern District. Although the permit holder actually set gear, he was unable to locate and retrieve any of the gear, therefore no commercial harvest of octopus occurred during 1989. No incidental harvest of octopus occurred in any of the other shellfish fisheries during 1989.

1990 Management Outlook

The high prices paid for octopus in recent years, as well as several recent publications promoting the potential octopus fishery in Alaska, are expected to produce a continued interest in octopus as a target species in 1990. The extent of this resource in Cook Inlet outside the Southern District is unknown and could ultimately affect any directed fishery. In the absence of a demonstrably effective method of harvest, the Cook Inlet octopus catch is not expected to increase significantly in 1990.

SEA URCHINS

Introduction

Sea urchins, and commercial fisheries for them, occur along the Pacific coast from California to Alaska, but the only species which

occurs in Cook Inlet is the green sea urchin, the smallest of the commercial urchin species. The animals are harvested solely for their gonads, considered a delicacy in the Orient. No commercial harvest for this species had ever occurred in Cook Inlet prior to 1987. In that year, one permit holder harvested a total of 224 pounds (whole weight) of urchins (Appendix Table 16), using diving gear.

The only current regulatory requirement for urchins in Cook Inlet is that each fisherman must obtain a Commissioner's permit prior to harvest. Utilizing available published information on this species as well as the framework of current management practices for a different species of the same genus in southeast Alaska, the Department established the following permit restrictions:

1) A minimum legal size of 1.75 inches and a maximum legal size of 2.50 inches, measured across the test and not including spines. The minimum size is intended to protect the broodstock, while the maximum size is intended to protect sufficient numbers of large urchins, which in turn provide a canopy that helps protect the smaller urchins.

2) Permit duration from mid-September through mid-December, the time period when the gonads are fullest and therefore of highest market quality. The permit may be extended past mid-December if recovery data is made available to the Department.

3) Methods of harvest limited to hand picking or use of an abalone iron. Hand picking is the traditional harvest method for urchins and is the least disruptive to the substrate.

4) Area of harvest in the Southern District alternated each year between that portion of Kachemak Bay east of Homer Spit and that portion west of the Spit, in order to reduce the potential of over-harvest in any one given area.

The market demand for urchin gonads appears to be substantial as evidenced by the amount of interest generated towards the harvest of this species. Most of these fishermen, however, assume that the urchins which occur in Cook Inlet are similar to those species which occur further south. The green urchin, being smaller in size, must be harvested in larger quantities to be economically profitable. Potential harvesters in the Cook Inlet area have found, through Personal Use investigations (i.e. collecting with a sport fishing license), that thus far the numbers of marketable urchins, regardless of the size limits, have not justified the investment in time and money necessary to establish an economical commercial venture.

1989-90 Season Summary

The coordinators of the previously mentioned otter rehabilitation centers requested that the Department allow the harvest of sea urchins during a normally closed time period, the summer, in order to provide food for the otters. The staff felt this a reasonable request, since urchins comprise a portion of the otter's diet in the wild, and issued the permits. All other permit restrictions remained in effect. Since no harvest of urchins had occurred in 1988, either the area east of the Spit or that west of the Spit could be opened in 1989, and the industry chose the area east of the Spit. During the months of June and July, one permit holder landed 8,885 pounds of urchins as otter food.

Interest in urchin harvesting during the normally open period remained low until November. One permit holder harvested 4,953 pounds of urchins for human consumption during November and December. After these deliveries, this fishermen requested that the maximum size limit be raised, because his divers were having difficulty sorting urchins on the grounds with the narrow size ranges in effect and because his Oriental market(s) demanded urchins of a larger size. After measuring some samples from China Poot Bay, the staff agreed to raise the upper size limit to 2.75 inches, only for the China Poot Bay area. In addition, permit extensions were granted, on a monthly basis, for the months of January and February, 1990. The recovery information during this time indicated that, despite the approach of the spawning season, the gonads remained in a condition acceptable to the market, therefore none of the urchins would be wasted.

The divers planned numerous trips during January and February, but cold and windy weather allowed only a few trips. Total harvest during these two months was 1,343 pounds taken by two permit holders. This brought the total 1989-90 harvest to 15,181 pounds harvested by three permit holders (Table 8), with 58.5 percent comprised of otter food and 41.5 percent for human consumption. Urchins which sold as otter food during 1989-90 averaged $1.00 per pound, bringing the ex-vessel value of this portion of the fishery to nearly $8,900. No prices of urchins purchased for use as human consumption during the period from November 1989 through February 1990 are available, therefore the total ex-vessel value for the 1989-90 Cook Inlet urchin fishery is unknown at this time.

1990-91 Management Outlook

As long as a strong market exists for urchin gonads, the harvest of these invertebrates is expected to generate a considerable amount of interest. Oriental markets apparently demand strict adherence

to guidelines in terms of urchin size and quality, and although the urchins of Kachemak Bay do meet these guidelines, it is questionable whether there are sufficient commercial quantities available to satisfy the economic minimums needed by the fishing and processing industries. Estimates of sea urchin abundance or occurrence elsewhere in the management area are unknown at this time.

Because the 1989 Southern District harvest came from the area east of the Homer Spit, the Department intends to open only the area west of the Homer Spit during 1990. This rotational harvest scheme between areas is not a new management approach directed solely at Cook Inlet harvesters, but rather is a common practice employed in Southeast Alaska as well as other Pacific Coast urchin fisheries to help protect against over-exploitation of any one given area. All other permit restrictions in Cook Inlet will remain in effect for 1990-91. Size limit modifications and/or season extensions will be determined, as in the past, on a case by case basis using the best available information.

It must be noted that sea urchin growth rates are highly variable on an annual basis. Should the stocks experience good growth rates during several successive years, an expansion of the commercial fishery remains a distinct possibility. However, present stock conditions suggest that effort will probably remain low in the near term.

LITERATURE CITED

Butler, T.H. 1980. Shrimps of the Pacific coast of Canada. Can. Bull. Fish. Aquat. Sci. 202: 280 p.

Olsen, J. 1975. Unpublished data. NMFS, Auke Bay, Alaska.

EEO STATEMENT

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Table 1. Numeric listing of shellfish emergency orders issued for the Cook Inlet Management Area (H and G), April 24, 1989 through January 2, 1990.

Emergency Order Number	Effective Date	Explanation
2-S-H-01-89	04/30/90	Closes Area G (Outer and Eastern Districts) to commercial pot shrimp fishing due to the presence of oil from the T/V Exxon Valdez effective at 12:00 noon April 30, 1989.
2-S-H-02-89	06/01/89	Closes the commercial pot shrimp fishery in Kachemak Bay of the Cook Inlet Management Area for the entire 1989/90 regulatory season.
2-S-H-03-89	07/01/89	Extends the closure of the Kachemak Bay commercial trawl shrimp fishery for the entire 1989/90 regulatory season.
2-S-H-04-89	07/07/89	Reopens Area G (Outer and Eastern Districts) to commercial pot shrimp fishing, effective at 12:00 noon July 7, 1989. Supersedes emergency order No. 2-S-H-01-89.
2-S-H-05-89	08/01/89	Closes the entire Cook Inlet Registration Area (H) to the commercial taking of red and blue king crab until August 1, 1990.
2-S-H-01-90	01/02/90	Closes the Southern, Outer, Eastern and Central Districts to the commercial harvest of Tanner crab for the entire 1990 regulatory season.
2-S-H-02-90	03/01/90	Closes the Kamishak Bay and Barren Islands Districts to the commercial harvest of Tanner crabs effective 12:00 noon March 1, 1990.

- Continued -

Table 1. Continued, Page 2 of 2

2-PU-H-01-89	08/01/89	Closes the entire Cook Inlet Management Area (H) to the taking of king crab for personal use until August 1, 1990.
2-PU-H-02-89	12/15/89	Extends the closure in the Southern, Outer, Eastern, and Central Districts of the Cook Inlet Management Area (H) to the taking of Tanner crab for personal use until further notice.

Table 2. Cook Inlet Management Area (H) Dungeness crab (Cancer magister) catch by district and statistical sub-area for the 1989 season.

District	Statistical Sub-area	No. of Vessels	No. of Landings	No. of Crab	No. of Pounds	No. of Pots Pulled	Average Weight per crab	Average Pounds per pot	No. of Crab per pot
Southern	241-11	9	47	19,734	44,632	6,516	2.26	6.85	3.03
	241-12	3	3	305	640	170	2.09	3.76	1.79
	241-13	24	137	15,452	30,409	11,579	1.96	2.63	1.33
	241-14	23	142	24,666	50,408	14,204	2.04	3.55	1.74
	241-15	17	93	8,679	17,398	5,762	2.00	3.02	1.51
	241-60	4	7	639	1,451	171	2.27	8.49	3.74
S. District Totals		41	420	79,479	170,266	40,504	2.14	4.20	1.96
Central	244-70	2	35	4,217	7,798	3,570	1.84	2.18	1.18
Area H Totals		43	455	83,696	178,064	44,074	2.12	4.04	1.90

Table 3. Catch and effort by month for the 1989 Dungeness crab fishery in the Cook Inlet Management Area (H).

Month	Southern District				Central District				Cook Inlet Total			
	Vess.	Lndgs.	Pounds	Cum.	Vess.	Lndgs.	Pounds	Cum.	Vess.	Lndgs.	Pounds	Cum.
Jan	1	1	160	160		NO	EFFORT		1	1	160	160
Feb	1	1	120	280		NO	EFFORT		1	1	120	280
Mar		NO	EFFORT	280		NO	EFFORT			NO	EFFORT	280
Apr	2	8	2,677	2,957		NO	EFFORT		2	8	2,677	2,957
May	7	19	4,862	7,819	1	1	126	126	8	20	4,988	7,945
Jun	17	64	16,891	24,710	1	9	1,213	1,339	18	73	18,104	26,049
Jul	26	110	57,281	81,991	1	14	3,516	4,855	27	124	60,797	86,846
Aug	28	107	66,652	148,643	2	9	2,243	7,098	30	116	68,895	155,741
Sep	21	60	11,867	160,510	1	2	700	7,798	22	62	12,567	168,308
Oct	14	26	6,939	167,449		NO	EFFORT	7,798	14	26	6,939	175,247
Nov	9	19	2,407	169,856		NO	EFFORT	7,798	9	19	2,407	177,654
Dec	4	5	410	170,266		NO	EFFORT	7,798	4	5	410	178,064
Cum. Vess.	41				2				43			

Table 4. Monthly catch per unit of effort (CPUE[a]) for Dungeness crab in the Southern District of the Cook Inlet Management Area (H), 1989.

Month	CPUE East of Homer Spit	CPUE West of Homer Spit	Cumulative Southern District CPUE
Jan	1.3	NO EFFORT	1.3
Feb	1.7	NO EFFORT	1.7
Mar	NO EFFORT	NO EFFORT	---
Apr	2.1	NO EFFORT	2.1
May	1.5	2.4	1.5
Jun	1.4	2.8	1.4
Jul	1.7	3.9	2.1
Aug	1.5	3.5	2.4
Sep	1.3	1.1	1.3
Oct	2.1	2.1	2.1
Nov	1.5	4.2	1.9
Dec	1.5	NO EFFORT	1.5
Average[b]	1.6	3.4	2.0

[a]CPUE is defined as the average number of legal males caught per pot.

[b]An average of all the crabs caught and pots pulled for the entire year.

Table 5. Cook Inlet area pot shrimp catch by district, statistical sub-area, and registration area for the 1989/90 Area H season and the 1988 Area G season, obtained from fish ticket information.

District	Statistical Sub-area	No. of Boats	No. of Landings	Coon-stripes	Spots	Pinks	Total Pounds	No. of Pots	Pounds per pot
Southern/ Area H	CLOSED BY EMERGENCY ORDER FOR ENTIRE 1989/90 SEASON								
Eastern[a]	231-05	1	2	350	700		1,050	820	1.3
Outer[a]	232-07	1	2	35	200	5	240	225	1.1
	232-10	1	1		12		12	10	1.2
	232-23	5	14	1,328	17,870[b]		19,198	15,768	1.2
Outer Dist.	Totals	7	17	1,363	18,082	5	19,450	16,003	1.2
Area G[a]/ Cook Inlet	Totals	8	19	1,713	18,782	5	20,050	16,823	1.2

[a]Area G was closed to commercial pot shrimp fishing from April 30 through July 7, 1989, due to documentation of oil on the fishing grounds.

[b]Includes 600 lbs. spot shrimp deadloss from one vessel due to oil contamination.

Table 6. Area H hardshell clam and mussel catch by district and statistical sub-area for the 1989 season, obtained from fish ticket information.

District	Statistical Sub-area	No. of Permits	No. of Landings	Little-neck Clams	Butter Clams	Cockles	Blue Mussels	Total Pounds
Southern	241-12	3	5		365		11,218	11,583
	241-13	7	38			2,600	72,917	75,517
	241-14	3	6		1,005		9,964	10,969
	241-15	7	23		4,008	981	27,941	32,930
	241-16	8	69	2,584	8,297		45,203	56,084
Southern Dist./ Area H Totals		9	141	2,584	13,675	3,581	167,243	187,083

Table 7. Monthly hardshell clam and mussel harvests in the Cook Inlet Management Area (H) during 1989.

Month	No. of Permits	No. of Landings	Clam Pounds	Mussel Pounds	Total Pounds
Jan	1	2	231	575	806
Feb	2	6	944	1,400	2,344
Mar	4	7	1,736	NO EFFORT	1,736
Apr	---	---	NO	EFFORT	-----
May	1	2	1,600	NO EFFORT	1,600
Jun	3	23	224	16,911	17,135
Jul	6	62	9,996	67,600	77,596
Aug	8	37	5,109	80,757	85,866
Sep	---	---	NO	EFFORT	-----
Oct	---	---	NO	EFFORT	-----
Nov	---	---	NO	EFFORT	-----
Dec	---	---	NO	EFFORT	-----
Totals	9	139	19,840	167,243	187,083

Table 8. Area H green sea urchin (Strongylocentrotus droebachiensis) harvest by district and sub-statistical area during 1989/90[a].

District	Statistical Sub-area	No. of Permits	No. of Landings	Total Pounds
Southern	241-14	1	1	627
	241-15	3	17	14,554
Area H Totals		3	18	15,181

[a]Cook Inlet urchin season normally open by permit from mid-September through mid-December; during 89/90, season was open during summer months of 1989 (to provide food for otter rehab center) and was extended into January and February, 1990.

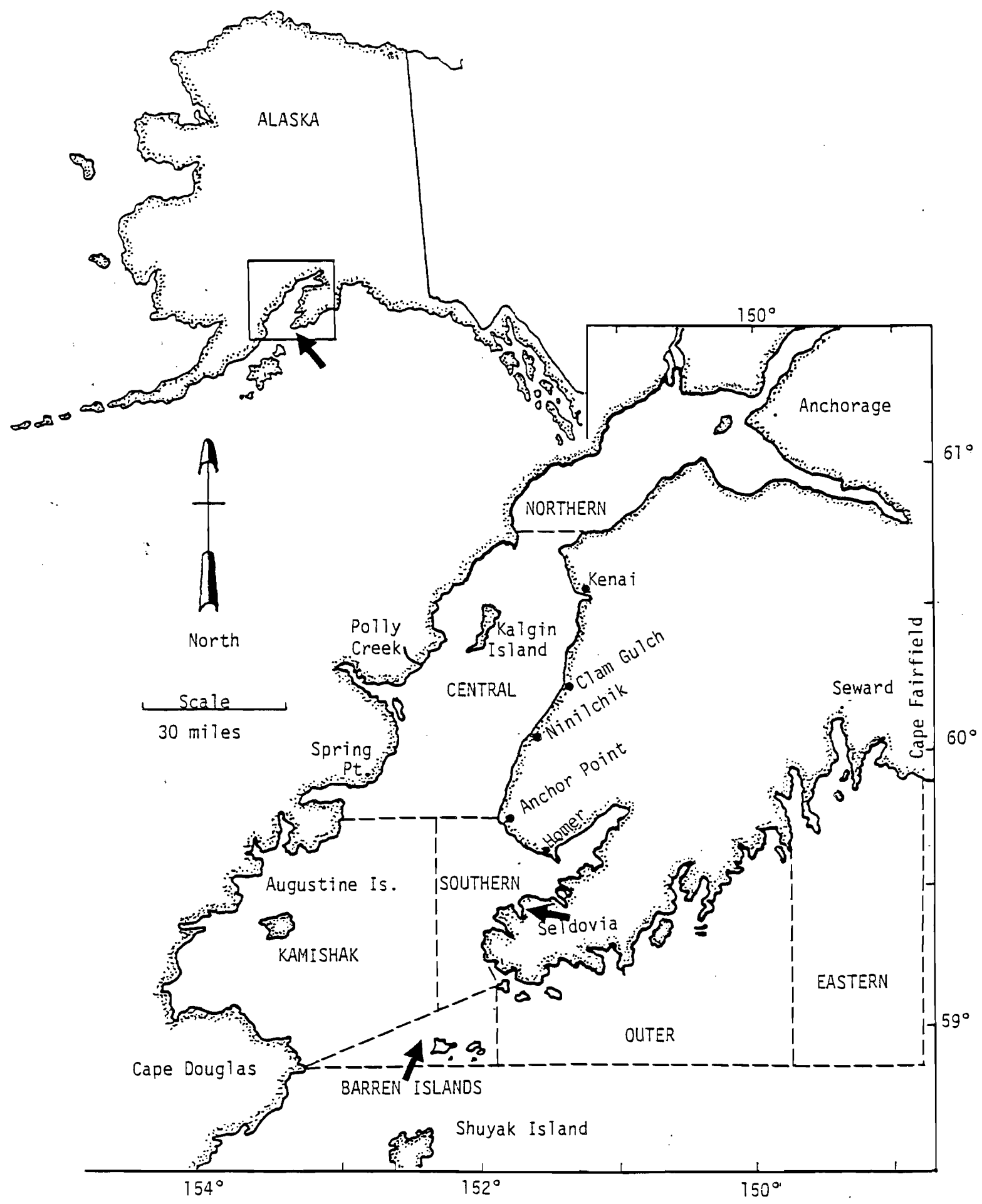


Figure 1. Cook Inlet district location chart.

ACE 6231868

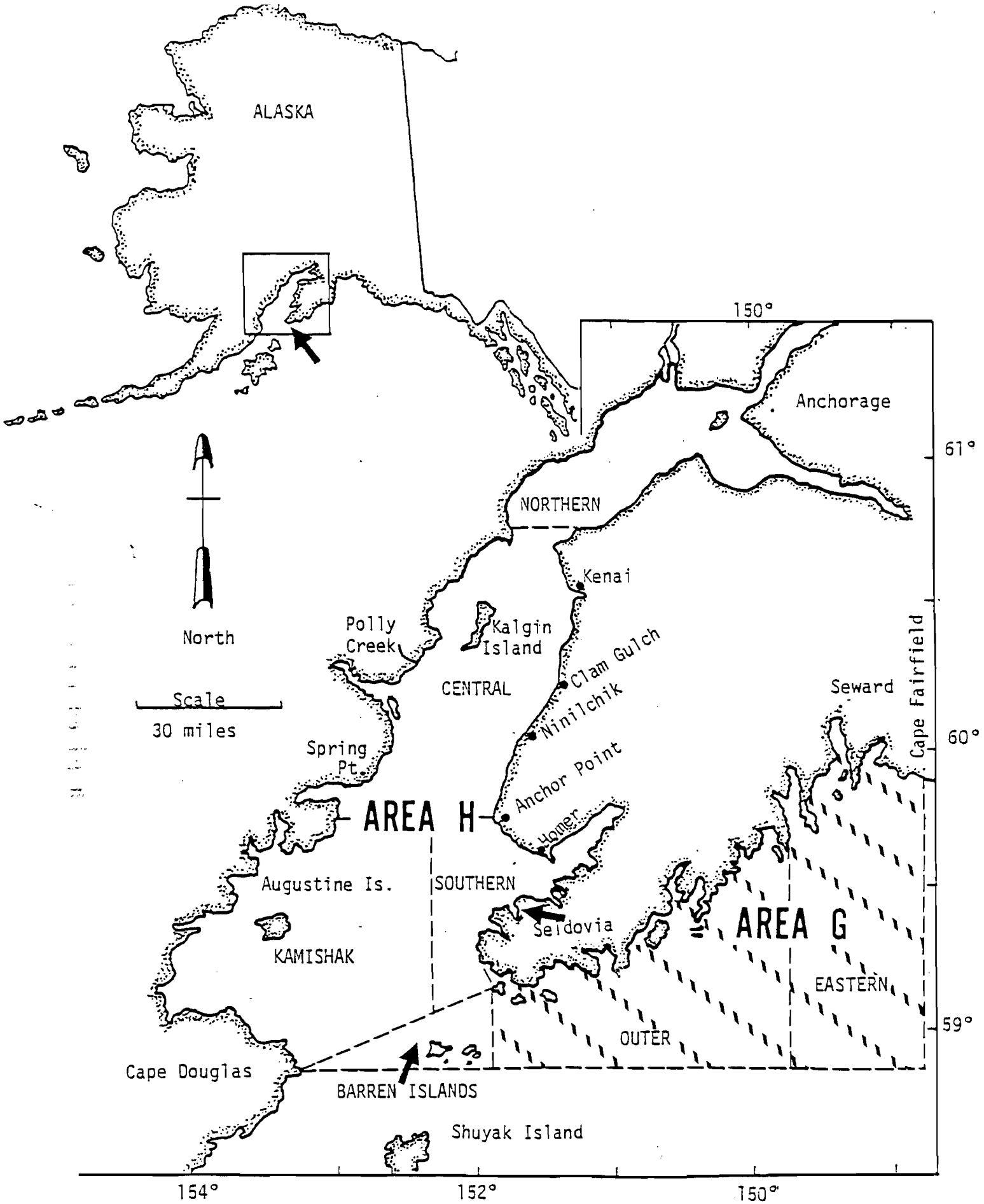


Figure 2. Cook Inlet Area (H) and Outer Cook Inlet Area (G) districts location chart for shrimp management.

ACE 6231869

Figure 3. Historical Tanner crab catch from the Cook Inlet Management Area, 1968-69 - 1990.

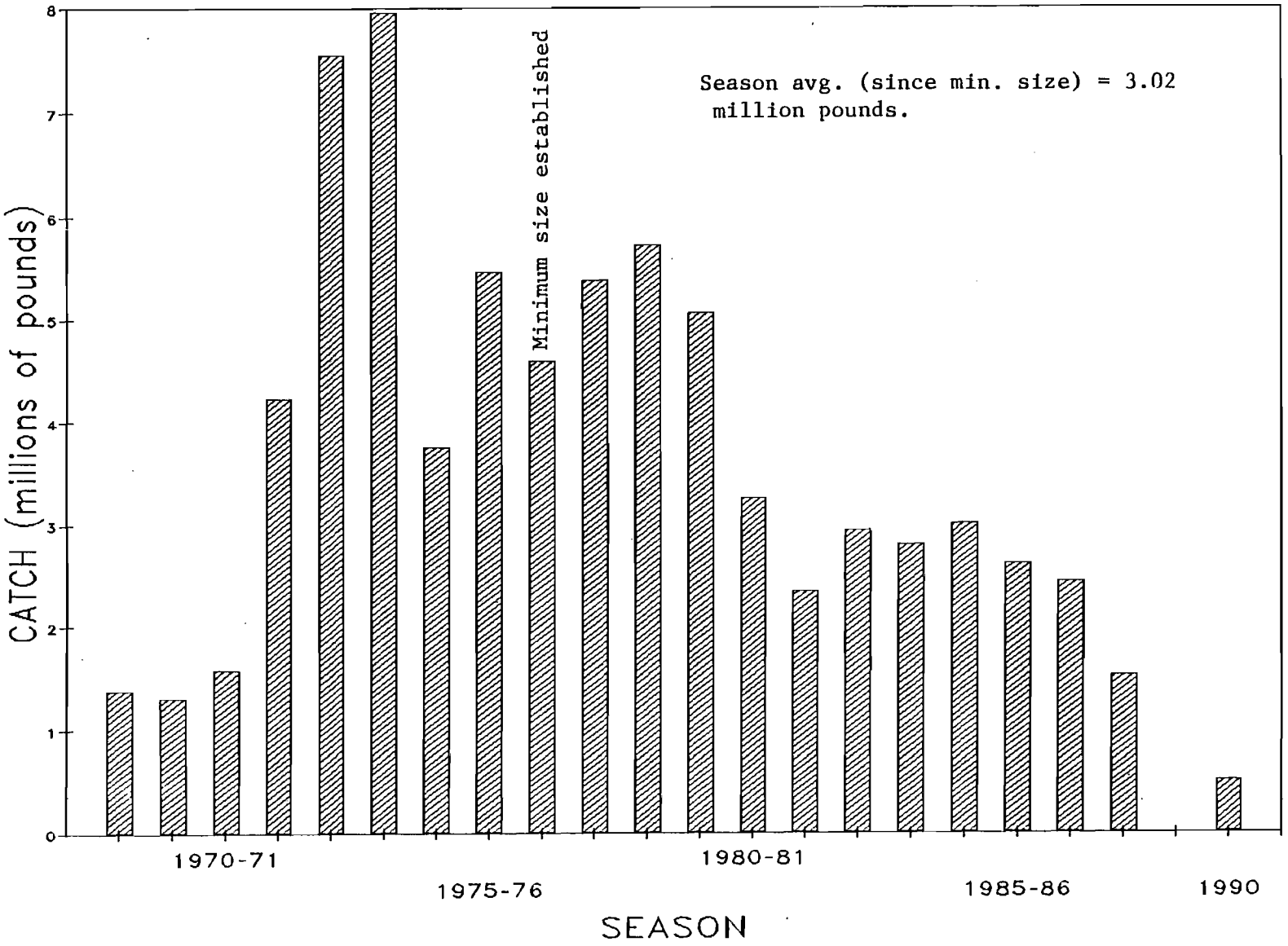


Figure 4. Average catch per pot of legal male Tanner crabs, Southern District index of abundance surveys, 1981-84, 1986-89.

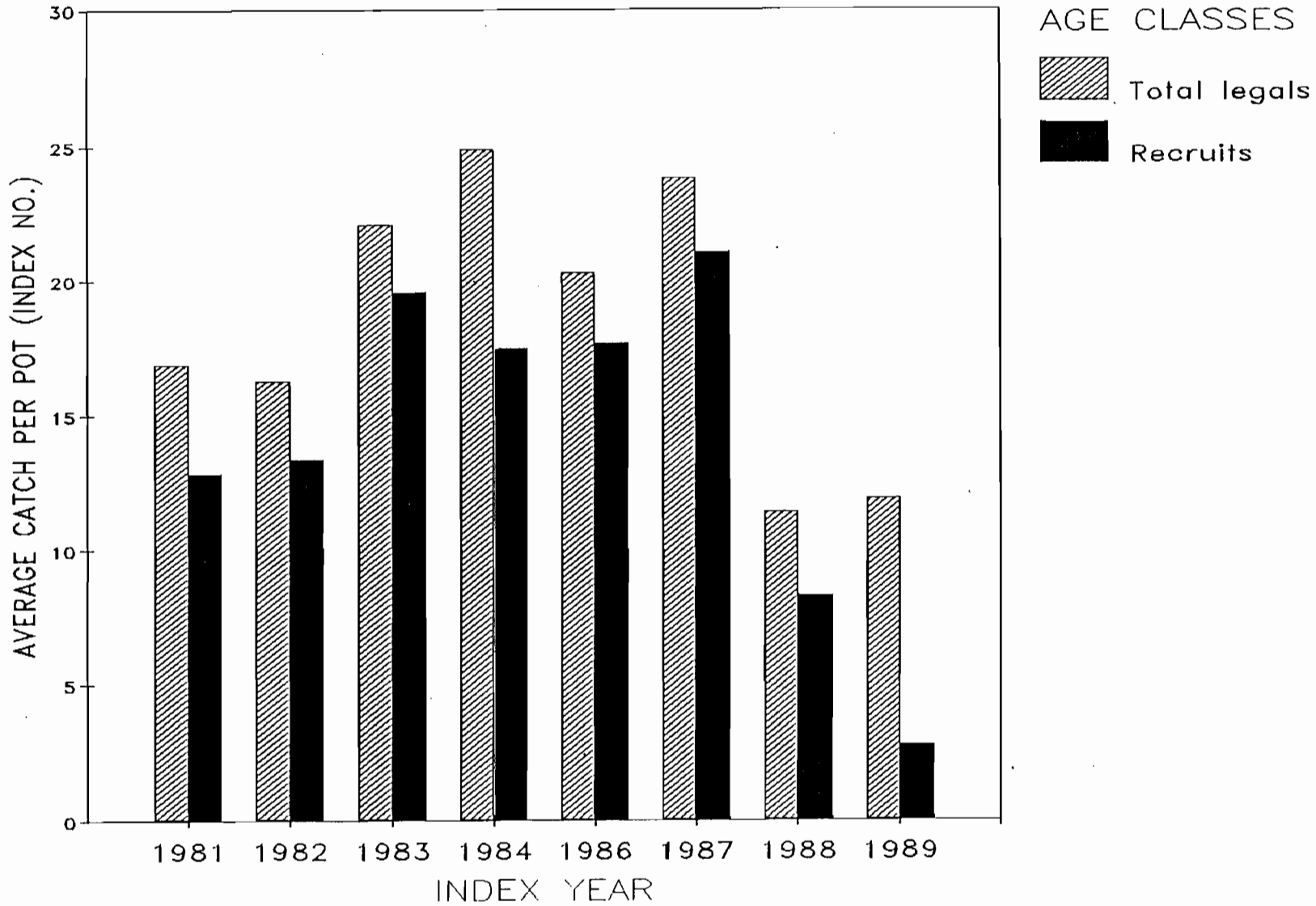


Figure 5. Average catch per pot of sublegal male Tanner crabs, Southern District index of abundance surveys, 1981-84, 1986-89.

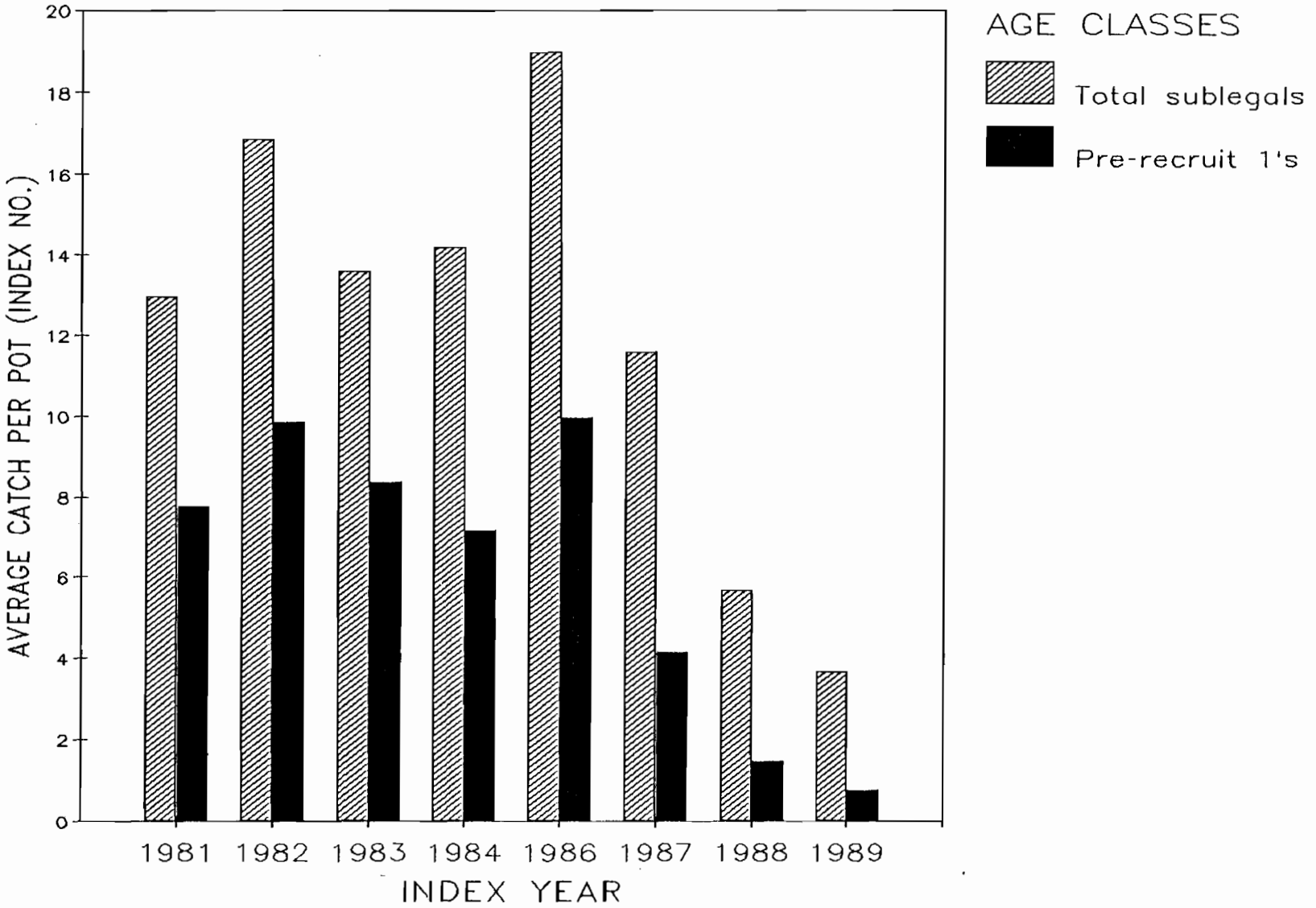


Figure 6. Historical commercial king crab catch, Cook Inlet Management Area, 1960 - 61 through 1989 - 90 seasons.

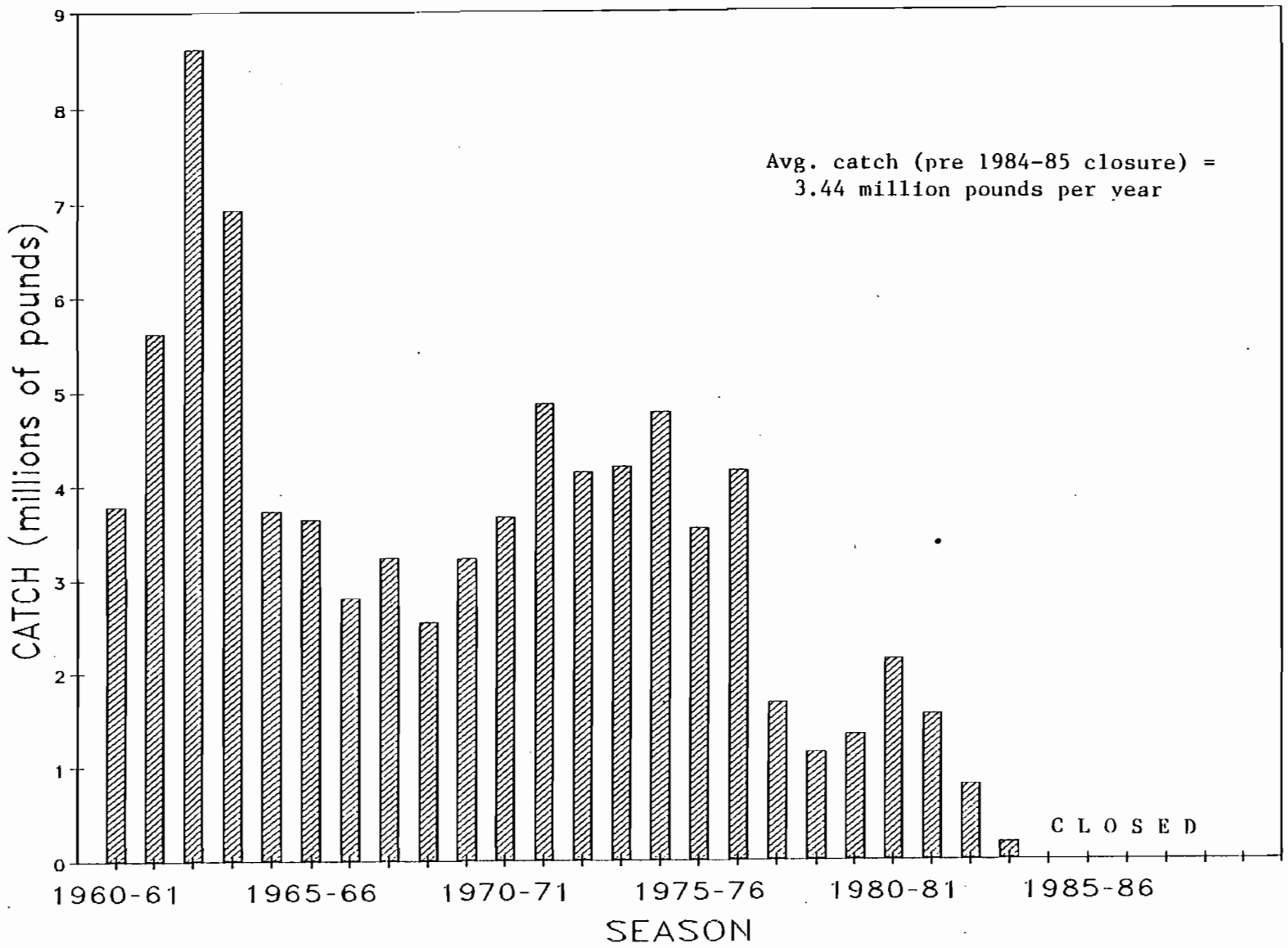


Figure 7. Average catch per pot of sublegal male king crabs, Southern District index of abundance surveys, 1981-89.

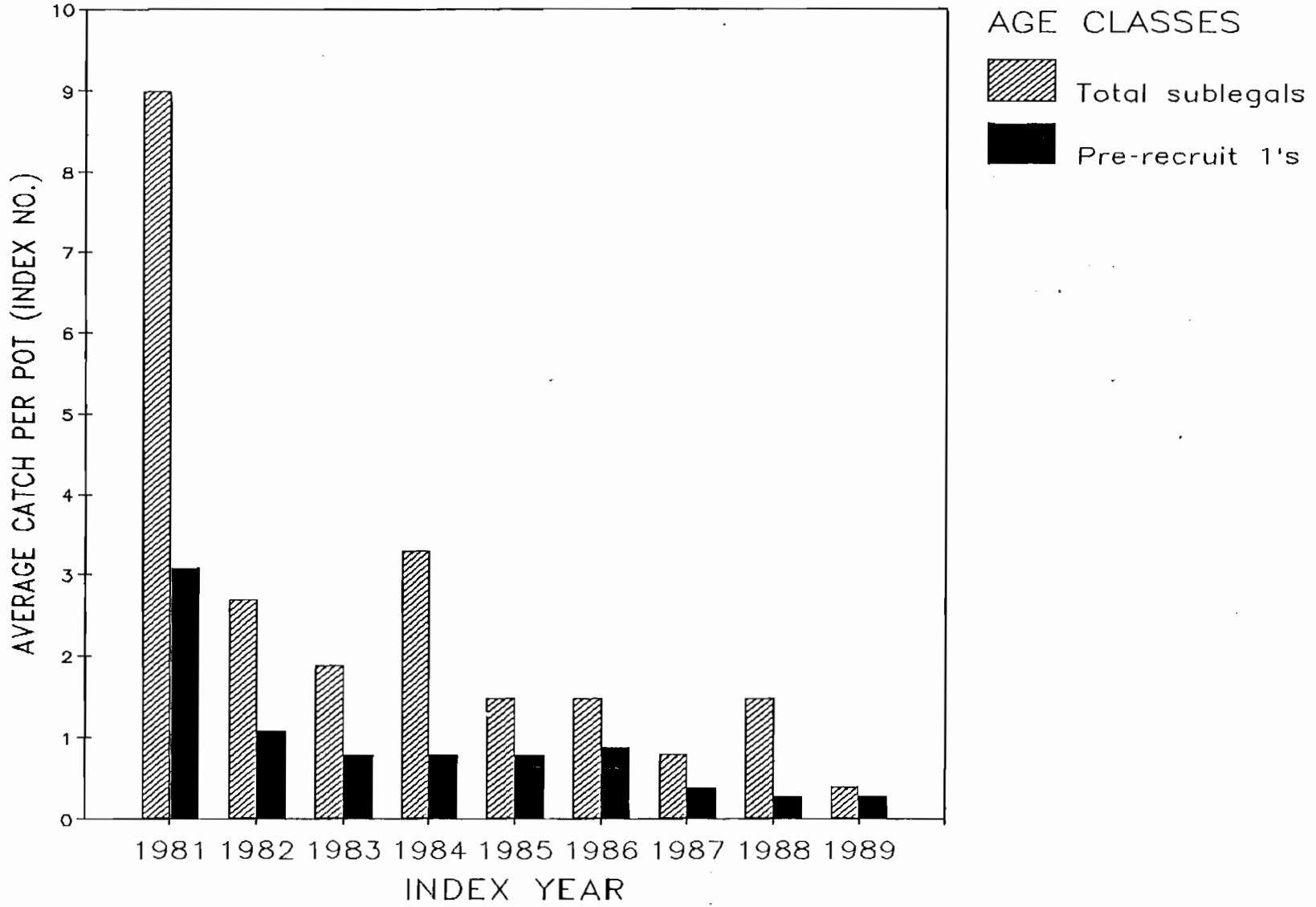


Figure 8. Average catch per pot of pre-recruit-1 and recruit male king crab, June Kamishak District index of abundance surveys, 1982-89.

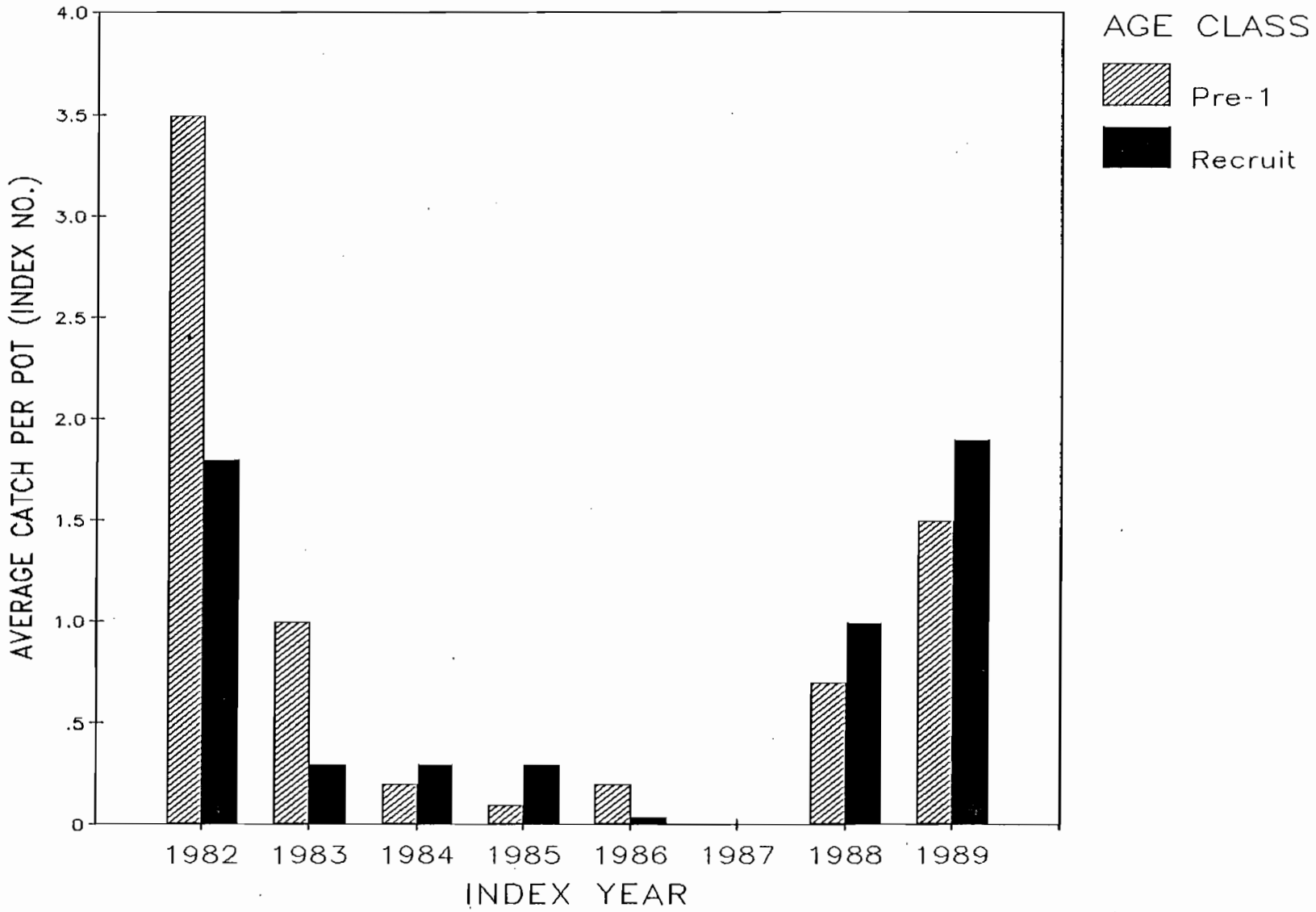


Figure 9. Historical percent of annual Dungeness crab harvest by month, Cook Inlet Management Area, 1979 - -1989.

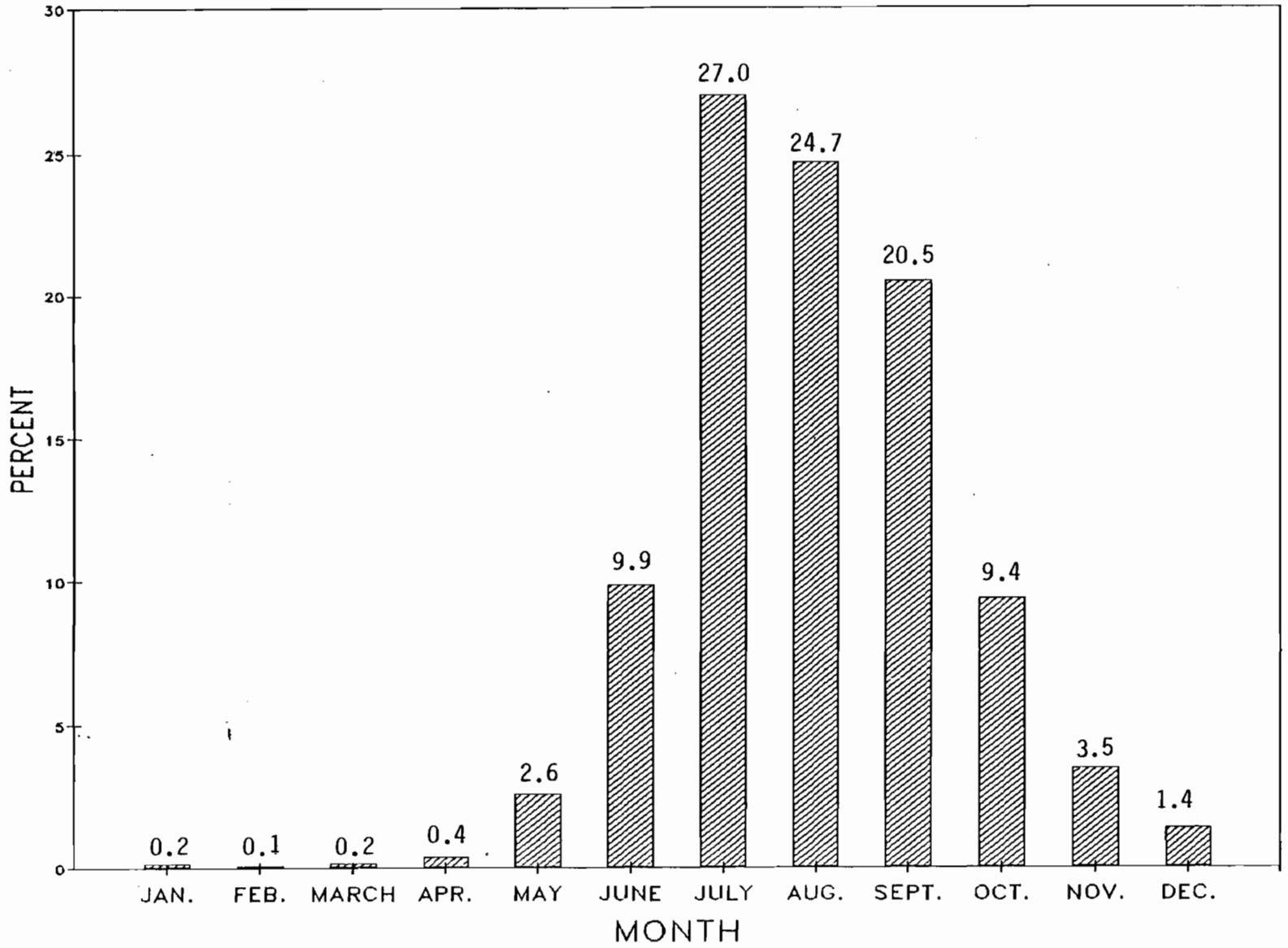
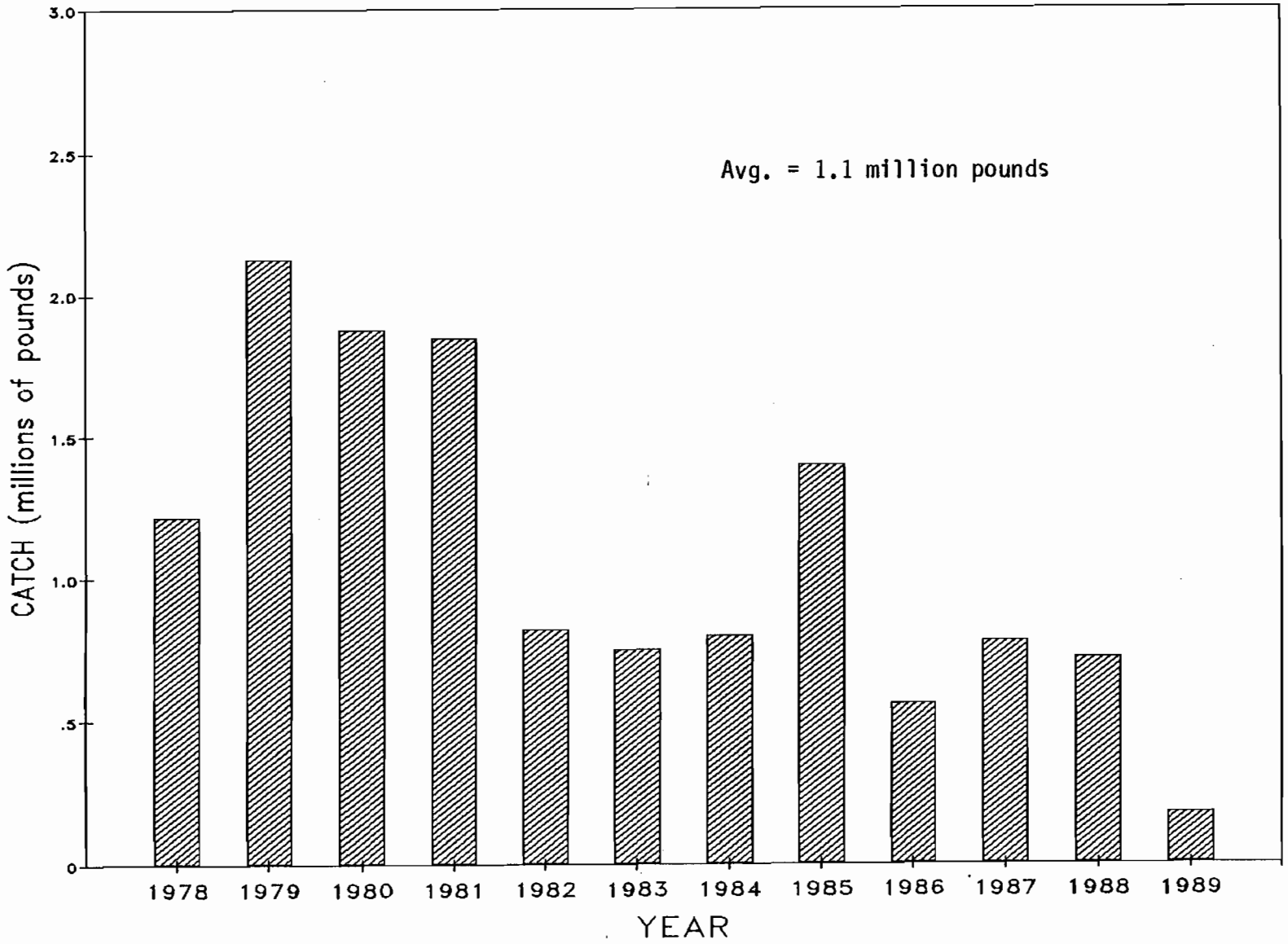


Figure 10. Dungeness crab catch by year, Cook Inlet Management Area, 1978 - 1989.



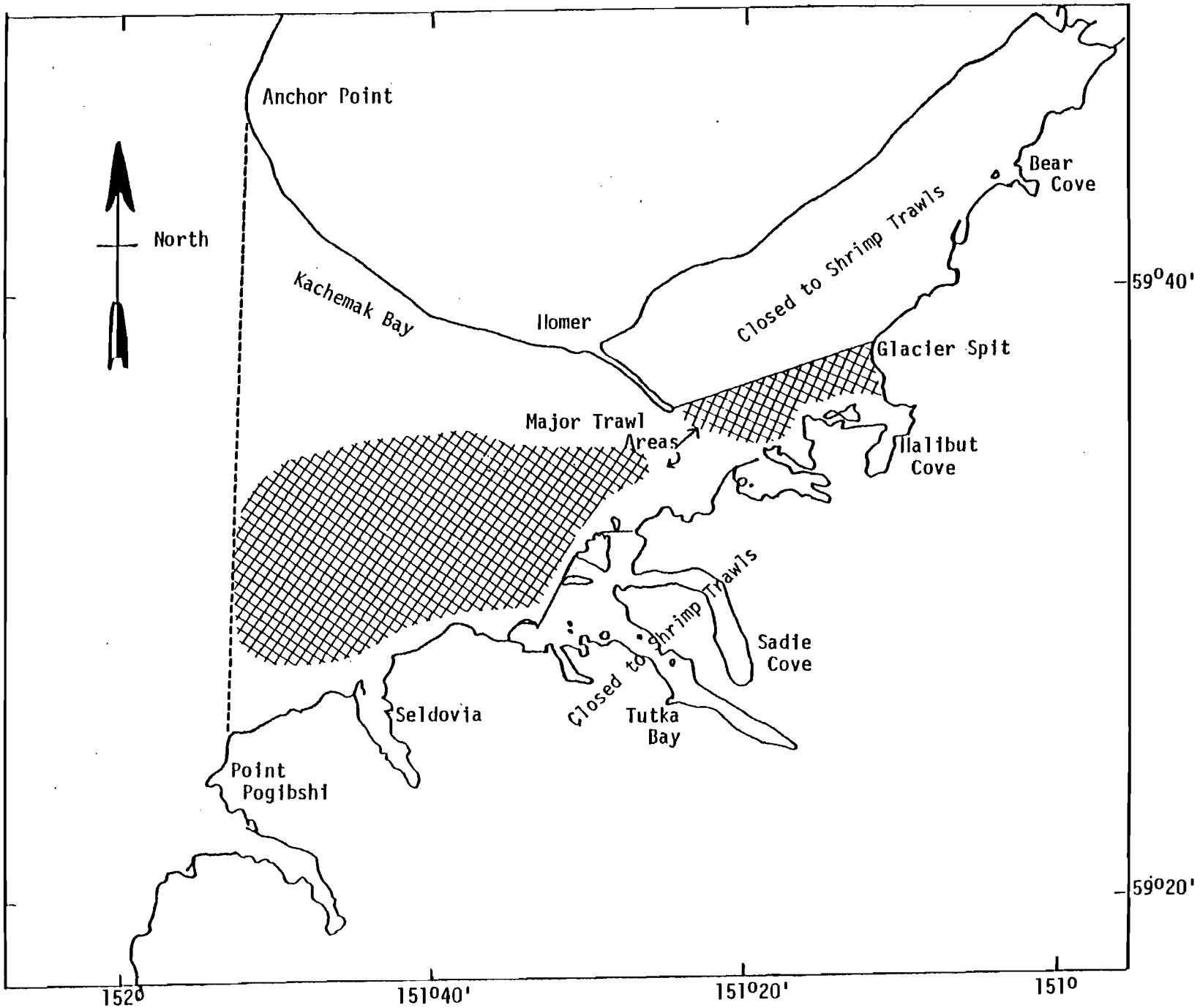


Figure 11. Location of commercial shrimp trawling in Kachemak Bay.

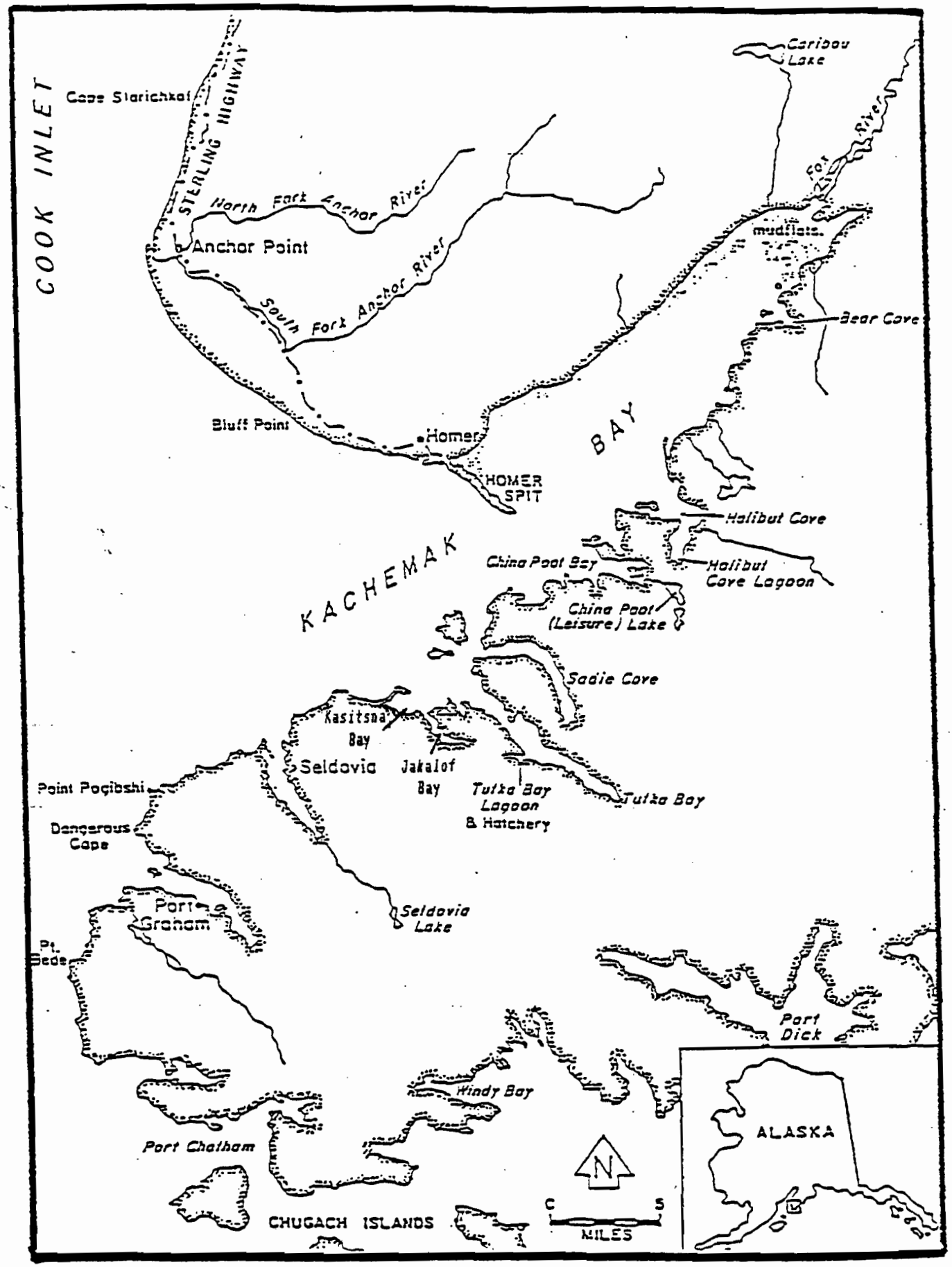


Figure 12. Kachemak Bay located in the Southern District of the Cook Inlet Management Area (H).

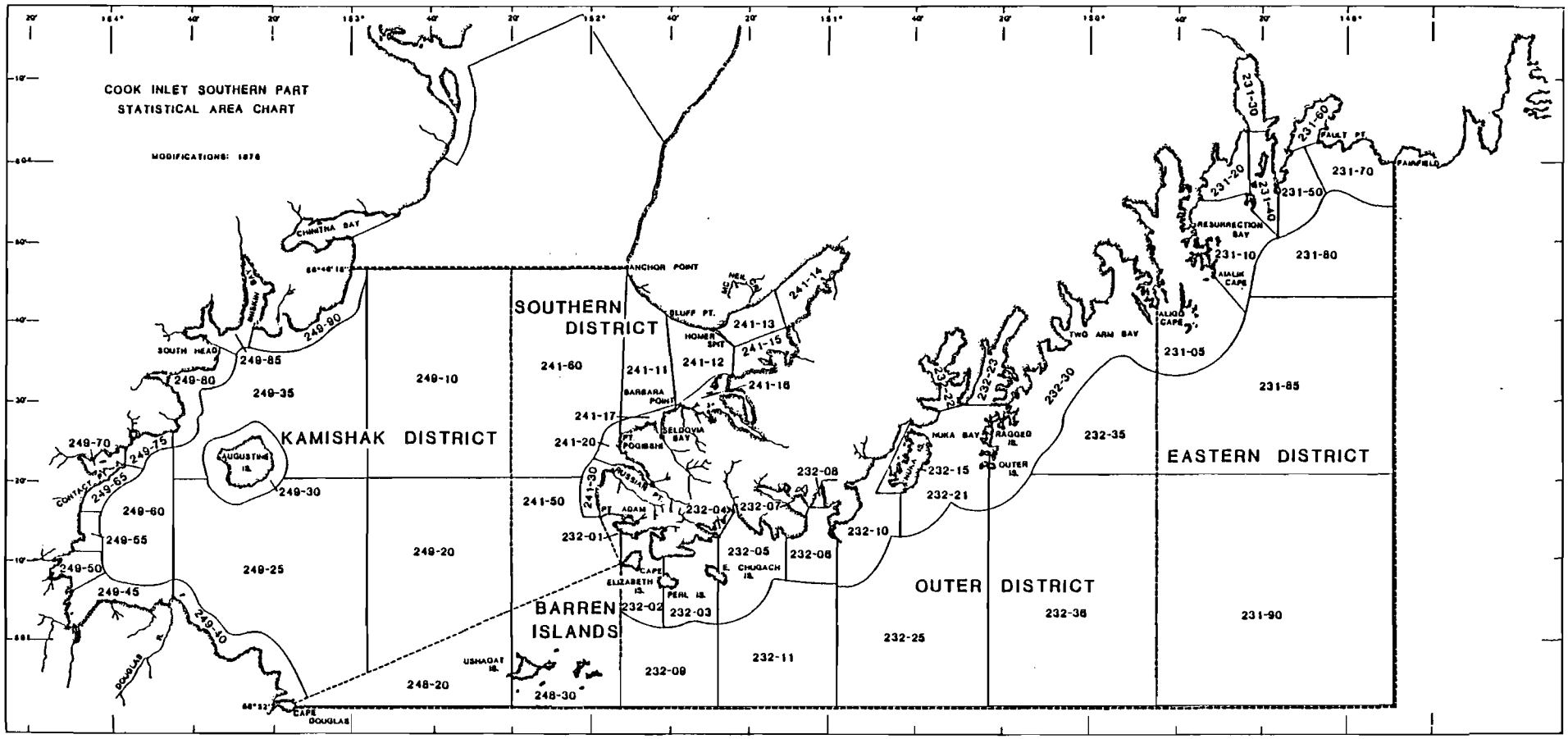


Figure 13. Cook Inlet Area chart showing districts and statistical sub-areas.

Appendix Table 1. Historical Tanner crab catch (pounds) and effort by district in the Cook Inlet Management Area (H).

Season	Southern	Vessels	Kamishak/ Barren Is.	Vessels	Outer/ Eastern	Vessels	Central	Vessels	Total catch	Total vessels
1968-69	1,388,282		12,398		816				1,401,496	
1969-70	1,147,154		71,196		104,191				1,322,541	
1970-71	1,046,803		541,212		3,000				1,591,015	
1971-72	2,462,956		974,962		804,765				4,242,683	
1972-73	2,935,662		3,361,023		1,266,023				7,562,708	
1973-74	1,387,535		4,689,251		1,891,021				7,967,807	
1974-75	967,762		2,150,462		656,660				3,774,884	
1975-76	1,339,245		3,281,084	17	850,964				5,471,293	57
1976-77	2,009,633	35	1,765,926	24	824,520				4,600,079	67
1977-78	2,806,568	55	2,077,092	28	502,049				5,385,709	92
1978-79	2,323,420	75	2,713,339	27	694,728				5,731,487	77
1979-80	1,134,940	68	3,338,623	24	595,645				5,069,208	68
1980-81	1,047,630	46	1,757,331	20	463,201				3,268,162	52
1981-82	548,529	41	1,286,332	18	524,897	9			2,359,758	51
1982-83	584,908	48	1,693,794	20	682,919	20			2,961,621	65
1983-84	996,763	45	1,373,674	17	443,384	14			2,813,821	71
1984-85	1,229,298	83	1,535,547	19	259,083	7			3,023,928	86
1985-86	1,164,261	103	1,288,711	24	177,041	5			2,630,013	109
1987	1,077,379	87	1,111,339	21	251,174	13	7,771	2	2,447,663	95
1988	944,763	127	417,182	24	168,969	23	8,396	3	1,539,310	137
1989	CLOSED	--	CLOSED	--	CLOSED	--	CLOSED	--	0	--
1990	CLOSED	--	510,034	7	CLOSED	--	CLOSED	--	510,034	7
Average[a]	1,133,435	61	1,490,637	20	399,115	11	4,042	3	3,024,342	75

[a] Since inception of minimum legal size between the 1976-1977 season.

Appendix Table 2. Average weight of Tanner crabs, by district, from the commercial fishery, Cook Inlet Management Area.

Season	Southern District	Kamishak/Barren Is. Districts	Outer/Eastern Districts	Central District
Prior to 1974	No	data	available	
1974-75	2.85	N/A	N/A	
1975-76	2.65	"	"	
1976-77	2.79	"	"	
1977-78	2.65	2.35	"	
1978-79	2.64	2.25	"	
1979-80	2.60	2.23	"	
1980-81	2.75	2.20	"	
1981-82	2.50	2.29	"	
1982-83	2.47	2.29	"	
1983-84	2.51	2.23	"	
1984-85	2.49	2.29	"	
1985-86	2.30	2.17	2.16	
1987[a]	2.31	2.26	2.23	2.33
1988	2.46	2.29	2.17	2.14
1989	CLOSED	CLOSED	CLOSED	CLOSED
1990	CLOSED	2.13	CLOSED	CLOSED
Average	2.57	2.25	2.19	2.24

[a] Season opened 1/15/87. Prior to this the season overlapped two calendar years.

Appendix Table 3. Historical commercial king crab catches (pounds and effort in the Cook Inlet Management Area (H).

Season	District			Total Catch	Number of Vessels
	Southern	Kamishak/ Barren Is.	Outer/ Eastern		
1960-61	2,699,680	986,551	118,067	3,804,298	
1961-62	1,619,642	3,642,500	368,909	5,631,051	
1962-63	2,763,343	5,509,708	343,505	8,616,556	
1963-64	1,960,426	4,915,303	59,352	6,935,081	
1964-65	1,892,479	1,850,572	963	3,744,014	
1965-66	1,948,012	1,684,346	14,491	3,646,849	
1966-67	1,347,904	1,386,008	89,510	2,823,422	
1967-68	1,117,397	1,883,605	239,518	3,240,520	
1968-69	750,906	1,711,296	87,302	2,549,504	
1969-70	1,464,721	1,688,803	73,644	3,227,168	
1970-71	1,540,018	2,115,991	9,468	3,665,477	
1971-72	1,992,224	2,868,315	12,657	4,873,197	
1972-73	1,391,024	2,756,023	1,966	4,149,013	
1973-74	1,971,841	2,236,131	5,613	4,213,585	
1974-75	1,816,512	2,965,310	2,035	4,783,857	
1975-76	1,674,872	1,832,484	45,293	3,552,649	
1976-77	1,035,316	3,103,895	16,384	4,155,595	
1977-78	584,090	1,099,279	1,350	1,684,719	74
1978-79	664,388	480,261	1,753	1,146,402	89
1979-80	853,584	489,365	4,871	1,347,820	82
1980-81	508,670	1,635,922	8,022	2,152,614	50
1981-82	183,899	1,371,821	4,143	1,559,863	53
1982-83	CLOSED	807,079	15,280	822,359	27
1983-84	CLOSED	188,027	4,504	192,531	17
1984-85	CLOSED	CLOSED	CLOSED	0	--
1985-86	CLOSED	CLOSED	CLOSED	0	--
1986-87	CLOSED	CLOSED	CLOSED	0	--
1987-88	CLOSED	CLOSED	CLOSED	0	--
1988-89	CLOSED	CLOSED	CLOSED	0	--
1989-90	CLOSED	CLOSED	CLOSED	0	--

Note: Average pre 1984-85 closure catch = 3.44 million pounds per year.

Appendix Table 4. Dungeness crab catch by year, Cook Inlet Management Area, 1961 - 1989.

Year	Southern district catch (lbs.)	Other districts catch (lbs.)	Total catch (lbs.)	Vessels	Landings
1961	193,683	0	193,683		
1962	530,770	0	530,770		
1963	1,665,599	11,605	1,677,204		
1964	417,005	6,036	423,041		
1965	74,211	0	74,211		
1966	12,523	117,037	129,560		
1967	7,168	0	7,168		
1968	484,452	3,407	487,859		
1969	49,894	0	49,894		
1970	209,819	0	209,819		
1971	97,161	0	97,161		
1972	38,930	0	38,930		
1973	308,777	1,271	310,048		
1974	718,729	2,514	721,243	38	619
1975	361,893	922	362,815	34	402
1976	118,903	395	119,298	19	123
1977	74,195	510	74,705	18	94
1978	1,212,571	3,208	1,215,779	49	668
1979	2,130,963	0	2,130,963	72	1,485
1980	1,875,281	0	1,875,281	54	1,183
1981	1,850,977	0	1,850,977	88	2,047
1982	818,380	505	818,885	108	2,310
1983	746,585	834	747,419	71	1,194
1984	799,638	570	800,208	102	1,687
1985	1,389,891	12,511	1,402,402	106	1,768
1986	550,968	12,894	563,862	83	1,069
1987	761,423	21,753	783,176	100	1,377
1988	677,334	41,941	719,275	84	1,305
1989	170,266	7,798	178,064	43	455

Note: Average catch since 1978-1989 = 1.09 million pounds per year.

Appendix Table 5. Historical Cook Inlet (Area H) Dungeness catch and percentage of total by month, 1979 - 1989.

LANDING MONTH	1979		1980		1981		1982		1983		1984		1985		1986		1987		1988		1989		AVERAGE	
	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	Catch(lbs)	%	CATCH(lbs)	%
Jan	0	0.0	7,361	0.4	4,495	0.2	1,408	0.2	1,359	0.2	5,566	0.7	2,671	0.2	746	0.1	3,248	0.4	2,431	0.3	160	0.1	2,677	0.2
Feb	0	0.0	0	0.0	7,276	0.4	191	0.0	532	0.1	2,595	0.3	1,278	0.1	1,323	0.2	733	0.1	0	0.0	120	0.1	1,277	0.1
Mar	125	0.0	0	0.0	15,494	0.8	112	0.0	635	0.1	5,257	0.7	884	0.1	349	0.1	1,359	0.2	475	0.1	0	0.0	2,245	0.2
Apr	0	0.0	0	0.0	12,839	0.7	1,618	0.2	1,575	0.2	14,743	1.8	1,336	0.1	749	0.1	3,959	0.5	5,978	0.8	2,677	1.5	4,134	0.4
May	6,927	0.3	18,037	1.0	115,571	6.2	25,765	3.1	21,179	2.8	48,904	6.1	13,213	0.9	7,670	1.4	16,671	2.1	32,168	4.5	4,988	2.8	28,281	2.6
Jun	72,073	3.4	82,325	4.4	332,072	17.9	32,665	4.0	107,247	14.4	202,817	25.3	150,580	10.7	30,616	5.4	53,281	6.8	94,851	13.2	18,104	10.2	106,966	9.9
Jul	500,485	23.6	708,042	37.9	453,894	24.5	305,166	37.3	182,104	24.5	160,087	20.0	334,875	23.9	75,241	13.3	150,953	19.3	263,665	36.7	60,797	34.1	290,483	27.0
Aug	430,250	20.3	511,364	27.4	440,868	23.8	225,018	27.5	180,783	24.3	121,251	15.2	444,386	31.7	121,825	21.6	206,162	26.3	173,107	24.1	68,895	38.7	265,810	24.7
Sep	611,479	28.9	336,154	18.0	401,556	21.7	139,715	17.1	115,767	15.6	103,191	12.9	245,951	17.5	137,901	24.4	221,006	28.2	105,769	14.7	12,567	7.1	221,005	20.5
Oct	259,949	12.3	152,134	8.1	57,874	3.1	57,881	7.1	78,317	10.5	78,902	9.9	151,627	10.8	135,155	24.0	110,591	14.1	29,436	4.1	6,939	3.9	101,710	9.4
Nov	151,064	7.1	45,693	2.4	5,383	0.3	19,164	2.3	33,425	4.5	48,625	6.1	50,697	3.6	34,760	6.2	13,712	1.8	8,475	1.2	2,407	1.4	37,582	3.5
Dec	86,866	4.1	5,586	0.3	3,655	0.2	10,182	1.2	20,395	2.7	8,270	1.0	5,777	0.4	17,902	3.2	1,501	0.2	2,920	0.4	410	0.2	14,860	1.4
Total	2,119,218	100.0	1,866,696	100.0	1,850,977	100.0	818,885	100.0	743,318	100.0	800,208	100.0	1,403,275	100.0	564,237	100.0	783,176	100.0	719,275	100.0	178,064	100.0	1,077,030	100.0
Total Dec-May	93,918	4.4	30,984	1.7	159,330	8.6	39,276	4.8	45,675	6.1	85,335	10.7	25,159	1.8	28,739	5.1	27,471	3.5	43,972	6.1	8,355	4.7	53,474	5.0
Jun-Nov	2,025,300	95.6	1,835,712	98.3	1,691,647	91.4	779,609	95.2	697,643	93.9	714,873	89.3	1,378,116	98.2	535,498	94.9	755,705	96.5	675,303	93.9	169,709	95.3	1,023,556	95.0
																			1986-89 Average Total				561,188	100.0
																			Dec-May				27,134	4.8
																			Jun-Nov				534,054	95.2

Appendix Table 6. Historical trawl shrimp catches by guideline harvest level for the Kachemak Bay trawl shrimp fishery in the Cook Inlet Management Area (H).

SEASON	NUMBER OF VESSELS	CATCH (lbs) JUN 1-OCT 31	NOV 1-MAR 31	APR 1-MAY 31	TOTAL
1969-70[a]	7	1,289,656	1,692,854	889,330	3,871,840
1970-71[a]	3	3,211,924	2,076,228	617,836	5,905,988
1971-72[a]	7	2,618,630	1,761,569	140,707	4,520,906
1972-73[a]	10	2,772,422	2,109,660		4,882,082
1973-74[b]	13	2,502,154	2,323,780		4,825,934
1974-75	4	2,512,764	2,519,148		5,031,912
1975-76	4	1,997,563	2,421,456		4,419,019
1976-77	5	2,545,885	2,453,101		4,998,986
1977-78	7	2,490,969	2,546,977		5,037,946
1978-79	6	2,952,733	3,060,066		6,012,799
		JUL 1-SEP 30	OCT 1-DEC 31	JAN 1-MAR 31	
1979-80	7	2,013,298	2,052,646	1,731,483	5,797,427
1980-81	15	1,780,298	2,691,746	1,704,706	6,177,129
1981-82	23	1,614,868	1,686,781	1,693,850	4,995,499
1982-83	15	998,522	1,012,388	1,009,857	3,020,767
1983-84	10	CLOSED	CLOSED	525,508	525,508
1984-85	10	519,651	528,506	518,529	1,566,686
1985-86	5	488,606	257,782	503,340	1,249,728
1986-87	3	504,206	CLOSED	CLOSED	504,206
1987-88	0	CLOSED	CLOSED	CLOSED	0
1988-89	0	CLOSED	CLOSED	CLOSED	0
1989-90	0	CLOSED	CLOSED	CLOSED	0

[a]Catches listed for comparative purposes by seasons established in 1973.
[b]June 1 - October 31 and November 1 - March 31 seasons with respective guidelines established.

Appendix Table 7. Abundance index estimates of commercial species of Pandalid shrimp (millions of pounds) in the Southern District (Kachemak Bay), by sampling period and year, based on pounds of shrimp caught per one nautical mile tow (traditional stations only).

MONTH	YEAR	MEAN CATCH (lbs/tow)	NUMBER OF STATIONS	% ERROR	ABUNDANCE INDEX (Mill. of lbs.)	RANGE (Mill. of lbs.)
SPRING						
May	1971	130.2[a]	56	20.0	3.7	3.0 to 4.5
May	1972	271.1[a]	66	35.5	7.7	5.0 to 10.5
May	1973	592.8[a]	59	27.8	16.9	12.2 to 21.6
Jun	1974	476.6[a]	30	22.8	13.6	10.5 to 15.7
May	1975	1,136.9[b]	37	27.9	16.2	11.7 to 20.7
May	1976	541.3	36	28.3	7.7	5.5 to 9.9
Jun	1977	407.9	40	17.1	5.8	4.8 to 6.8
May	1978	810.9	36	25.2	11.5	8.6 to 14.5
May	1979	743.7	41	20.9	10.6	8.4 to 12.8
May	1980	513.7	39	19.5	7.3	5.9 to 8.7
May	1981	486.1	37	18.4	6.9	5.6 to 8.2
May	1982	306.8	38	21.8	4.4	3.4 to 5.3
May	1983	204.0	37	24.8	2.9	2.2 to 3.6
May	1984	282.3	34	34.2	4.1	3.0 to 5.2
May	1985	197.5	34	39.7	3.2	1.9 to 4.5
May	1986	157.2	34	50.9	2.6	1.3 to 4.0
May	1987	178.8	34	45.2	3.0	1.6 to 4.3
May	1988	247.5	33	45.0	4.1	2.3 to 6.0
May	1989	90.5	31	65.9	1.5	0.5 to 2.5
FALL						
Oct	1976	719.8	33	21.6	10.3	8.0 to 12.5
Nov	1977	738.1	36	28.9	10.5	7.5 to 13.5
Oct	1978	1,160.3	32	25.5	16.5	12.3 to 20.7
Oct	1979	1,133.3	32	23.3	16.1	12.4 to 19.9
Oct	1980	1,689.4	37	19.3	24.1	19.4 to 28.7
Oct	1981	604.8	35	26.9	7.9	5.8 to 10.0
Oct	1982	519.2	36	26.3	7.4	5.4 to 9.3
Oct	1983	481.3	36	36.6	6.9	4.9 to 8.8
Oct	1984	531.9	35	26.3	7.6	6.1 to 9.1
Oct	1985	284.9	34	32.0	4.1	2.8 to 5.4
Sep	1986	154.0	34	37.9	2.6	1.6 to 3.6
Sep/Oct	1987	227.0	34	66.1	3.8	1.3 to 6.3
Nov	1988	152.3	28	64.8	2.5	0.9 to 4.2
Sep	1989	84.8	32	49.0	1.4	0.7 to 2.1

[a]66' Nordby net, 50% assumed net efficiency.

[b]From this survey to present, a 61' NMFS net with 100% assumed net efficiency has been used.

Appendix Table 8. Historical average numbers of pink shrimp (Pandalus borealis) per pound by area from samples taken during ADF&G trawl index surveys in the Southern District (Kachemak Bay) of the Cook Inlet Management Area (H).

Year	East of Homer Spit: Open Commercial Area Pink Count/lb.	East of Homer Spit: Closed Commercial Area Pink Count/lb.	East of Homer Spit: Combined Avg. Pink Count/lb.	West of Homer Spit Pinks/lb.	Combined Avg. All Areas Pinks/lb.[a]
Spring Survey					
1971	230.3	213.4	220.0	159.6	180.4
1972	185.3	203.1	196.7	137.3	151.9
1973	230.4	167.2	182.5	152.0	158.5
1974	133.8	125.6	129.5	126.0	126.8
1975	154.6	143.5	150.0	135.9	138.1
1976	169.6	157.8	165.9	107.5	126.7
1977	144.7	142.7	143.5	109.0	120.5
1978	155.0	163.6	158.6	123.7	130.2
1979	170.7	203.3	185.1	126.6	147.1
1980	173.6	190.1	181.7	112.0	127.5
1981	193.1	190.9	192.2	111.7	134.9
1982	180.8	177.2	178.7	112.8	129.2
1983[May/Jun]	151.3	176.2	164.0	102.6	128.3
1983[Jul]	169.3	194.4	177.0	106.7	161.0
1984	177.5	224.2	206.7	98.5	142.6
1985	193.8	244.3	220.9	199.0	218.2
1986	155.5	229.4	200.5	NO SAMPLES	200.5
1987	134.8	271.4	212.6	108.5	204.7
1988	107.5	247.3	209.8	95.0	175.5
1989	121.3	197.7	184.4	85.0	176.3

-Continued-

Appendix Table 8, page 2 of 2.

Year	East of Homer Spit: Open Commercial Area Pink Count/lb.	East of Homer Spit: Closed Commercial Area Pink Count/lb.	East of Homer Spit: Combined Avg. Pink Count/lb.	West of Homer Spit Pinks/lb.	Combined Avg. All Areas Pinks/lb.[a]
Fall Survey					
1976	NO SAMPLES	144.1	144.1	112.5	123.0
1977	NO SAMPLES	164.0	164.0	144.1	152.7
1978	148.1	159.6	155.0	133.4	140.3
1979	149.8	NO SAMPLES	149.8	135.0	138.4
1980	150.8	183.0	173.3	135.4	144.2
1981	112.9	182.0	154.2	127.2	139.5
1982	202.0	181.9	191.1	106.8	149.5
1983[Oct]	198.9	232.7	217.8	146.2	200.9
1983[Dec]	118.3	218.4	170.2	NO SAMPLES	170.2
1984	183.8	205.8	196.3	142.6	168.9
1985	190.0	246.7	234.7	247.5	239.1
1986	215.3	230.7	223.2	131.4	207.7
1987	115.0	184.0	152.0	NO SAMPLES	152.0
1988	109.5	146.5	138.8	83.1	138.6
1989	145.3	188.8	178.0	92.0	174.7

[a]Does not include any samples from the Tutka Bay/Sadie Cove area.

Appendix Table 9. Historical trawl shrimp catches in Outer Cook Inlet (Area G) of the Cook Inlet Management Area.

Season	Number of Vessels	Catch (lbs.)
1977-78	2	26,556
1978-79	1	1,245
1979-80	0	0
1980-81	1	4,000
1981-82	2	19,454
1982-83	4	239,584
1983-84	7	760,430
1984-85	11	1,957,959
1985-86[a]	4	421,063
1986-87	2	297,762
1987-88	1	22,231
1988-89	1	4,878
1989-90	0	0

[a]Regulatory season of 1 June through 28 February adopted by the Alaska Board of Fisheries in spring, 1985.

Appendix Table 10. Historical pot shrimp harvest in Area H of the Cook Inlet Management Area.

Season	Catch (lbs.) JUN 1 - SEP 30	OCT 1 - MAY 31	Total	Vessels
1969-70				
1970-71	3,606	7,602	11,208	
1971-72	8,836	70,601	79,437	
1972-73	75,247	184,230	259,477	
1973-74	63,181	738,165	801,346	
1974-75	43,650	126,472	170,122	
1975-76	100,765	273,758	374,523	
1976-77	52,115	199,559	251,674	26
1977-78	85,511	511,938	597,449	51
1978-79	49,080	121,234	170,314	41
1979-80	59,963	177,927	237,890	49

	JUN 1 - SEP 15 Vessels	NOV 1 - DEC 31 Vessels	FEB 1 - MAR 31 Vessels		
1980-81	74,368	134,275	104,716	313,359	30
1981-82	56,092	47,859	49,885	153,836	45
1982-83	54,153	49,130	52,339	155,622	40
1983-84	21,438	CLOSED	CLOSED	21,438	15
1984-85	25,874	28,151[a]	22,080	76,105	22

	JUN 1 - SEP 15 Vessels		OCT 1 - DEC 31 Vessels		FEB 1 - MAR 31 Vessels			
1985-86	27,312		20,737		24,048[b]		872,097	25
1986-87	24,844	18	20,188	11	30,257	19	75,289	37
1987-88	26,216	26	5,416[c]	8	CLOSED		31,632	30
1988-89	5,323[d]	9	CLOSED		CLOSED		5,323	9
1989-90	CLOSED		CLOSED		CLOSED		0	0

[a]Season extended through 1/31/85.

[b]Season extended through 4/5/86 due to eruptions of Augustine volcano and subsequent ash fallout.

[c]Season closed by E.O. on 11/13/87 due to low CPUE and high incidence of small shrimp.

[d]Season closed by E.O. on 6/22/88 due to limited amount of CPUE information and depressed stocks.

Appendix Table 11. Historical pot shrimp harvest and effort in Outer Cook Inlet (Area G) of the Cook Inlet Management Area.

Season	Number of Vessels	Catch (lbs.)
1977	6	1,776
1978	11	10,157
1979	5	4,211
1980	3	2,911
1981	5	2,031
1982	7	2,805
1983	13	18,679
1984	5	5,504
1985	6	3,305
1986	4	2,967
1987	9	12,458
1988	7	13,445
1989[a]	8	20,500[b]

[a]Season closed from April 30 through July 7 due to T/V Exxon Valdez oil spill.

[b]Includes 600 lbs. deadloss, oiled spot shrimp.

Appendix Table 12. Historical Pacific weathervane scallop (Pecten caurinus) catches in the Cook Inlet Management Area.

Year	District	Number of Vessels	Catch (lbs) of Shucked meats
1983	Kamishak	1	2,346
1984	Kamishak	3	6,305
1985[a]	Kamishak	1	11,810
1986	Kamishak	3	15,364
1987	Outer Kamishak[b]	1	1,128
		2	360
	'87 Total	2	1,488
1988	NO EFFORT IN COOK INLET		
1989	NO EFFORT IN COOK INLET		

[a]Season and harvest guideline set by regulation.

[b]Season closed by E.O. on August 21, 1987, one week after opening, due to low C.P.U.E.

Appendix Table 13. Historical Cook Inlet harvest of hardshell clams (all species) and mussels.

Year	Hardshell Clams (lbs.)	Mussels (lbs.)	Total (lbs.)	No. of Permits
1986	17,303	0	17,303	5
1987	14,767	102	14,869	8
1988	14,449	0	14,449	2
1989	19,840[a]	167,243[b]	187,083	9

[a]Includes 15,329 lbs. sold as otter food.

[b]Includes 165,268 lbs. sold as otter food.

Appendix Table 14. Commercial harvest of razor clams (Siliqua patula) in the Cook Inlet Management Area (H), 1919-1989[a].

Year	Pounds	Year	Pounds
1919	76,963	1955	0
1920	11,952	1956	0
1921	72,000	1957	0
1922	510,432	1958	0
1923	470,280	1959	0
1924	156,768	1960	372,872
1925	0	1961	277,830
1926	0	1962	195,650
1927	25,248	1963	0
1928	0	1964	0
1929	0	1965	0
1930	0	1966	0
1931	No record	1967	0
1932	93,840	1968	0
1933	No record	1969	0
1934	No record	1970	0
1935	No record	1971	14,755
1936	No record	1972	31,360
1937	8,328	1973	34,415
1938	No record	1974	0
1939	No record	1975	10,020
1940	No record	1976	0
1941	0	1977	1,762
1942	0	1978	45,931
1943	0	1979	144,358
1944	0	1980	140,240
1945	15,000	1981	441,949
1946	11,424	1982	460,639
1947	11,976	1983	269,618
1948	2,160	1984	261,742
1949	9,672	1985	319,034
1950	304,073	1986	258,632
1951	112,320	1987	312,349
1952	0	1988	392,610
1953	0	1989	222,747
1954	0		

[a]Data for 1919 - 1968 from Nickerson (1975). Data for 1969 - 1983 from IBM fish ticket summaries (ADF&G, Division of Commerical Fisheries, Computer Services).

Appendix Table 15. Historical commercial octopus (Octopus dofleini) harvest in the Cook Inlet Management Area (H).

Year	No. of Vessels	Total Pounds
1986	8	435
1987	21	4,512
1988	17	5,569
1989	NO REPORTED LANDINGS	

Appendix Table 16. Historical commercial green sea urchin (Strongylocentrotus droebachiensis) harvest harvest in the Cook Inlet Management Area (H).

Year	No. of Permits	Total Pounds
1987	1	224
1988	N O E F F O R T	
1989[a]	3	15,181

[a]Season during 1989 longer than in previous years, from June 1989 through February 1990 (normal season September 15 through December 15).